$4.00 a Year

50c a Copy

MAY 17 1938

VETERINARY MEDICINE

JUNE 1938

CONTENTS

A Small Animal Hospital....265
Diamond Jubilee of the A. V. M. A. 266
The Modern Stream-Lined Animal Hospital....268
Leucemia in the Cow....271
A Brief Consideration of Veterinary Diathermy....273
Sunburned Calf 275
Brucella Abortus Antigen and Plate Agglutination Test..276
Ketosis in Cattle and Sheep....280
Dystocia Followed by Metritis and Eclampsia....282
Enlargement of the Lacrymal Caruncles....282
Maurice Crowther Hall—Obituary....283
Dog and Cat Fleas....284
Calcium Metabolism 286
Vitamins and Nutrition....286
Intussusception in the Oviduct of a Hen....287
A Case of Imperforate Anus in a Pig....287
Butyl Chloride as an Anthelmintic....288
Surgical Treatment of Chronic Laminitis....288
Prevention of Blackhead in Turkeys....289
Digestion and Absorption of Raw Starch in Dogs....290
Parasites in Some Wild Fur Bearers....291
Iodine Vapor Therapy....292
Helminthiasis and Eczema in Dogs....294
Canine Pediatrics 295
Torsion of the Large Colon....299
Abstracts of Recent Veterinary Literature....300-302
Brucellosis of Swine, 300; Castration of Lambs, 300; Do Dogs Dream? 301; Source and Functions of Vitamin A, 301; Diagnosis of Hog Cholera, 301; Control of Hog Cholera, 301; Pyometra in a Cow, 301; Brown Thymol Test and Physical Changes in Milk, 302; Bacteria Counts of Ice Cream, 302; Vitamin B Deficiency in Sheep, 302; Resistance of Trichomonads, 302; Diet and Fertility, 302.

VOL. XXXIII
No. 6

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

7632 S. Crandon Ave.
Chicago, U. S. A.

"And Now, Doctor, WHAT SHALL I FEED HIM?"

Part of restoring a dog to health, as every Veterinarian knows, is the diet. And equally important in keeping him well, too!

When the "feeding question" comes up you may safely suggest "BIOLOGICALLY-TESTED NUTRENA DOG FOOD." This ALL-IN-ONE FOOD is easy to feed—economical—and advised for all breeds and sizes.

If you would like to know more about NUTRENA Dog Food—*made to a Biological standard*—write to Nutrena Mills, Inc., Kansas City, Kansas. We will mail you a professional sample FREE!

Nutrena DOG FOOD

Veterinary Medicine

Registered in U. S. Patent Office

VOL. XXXIII JUNE, 1938 No. 6

Published Monthly by the Veterinary Magazine Corporation
7632 S. Crandon Ave., Chicago, Ill., U. S. A.
$4.00 a Year; per Copy 50 Cents; Special Issues $1.00
Copyrighted 1938, by Veterinary Magazine Corporation.

All matter appearing in this publication is covered by copyright, and no part of it may be reproduced without specific permission.

Permission will be granted on request for reproduction of anything in the columns of VETERINARY MEDICINE if the purpose of the reproduction is unobjectionable. Where there is any question as to the propriety of reproduction, the wishes of the author will be consulted.
D. M. Campbell, Editor A. T. Kinsley, Associate Editor
H. J. Mostyn, 1265 Broadway, New York, Eastern Representative
Telephones: Chicago, South Shore 7160; Kansas City, Logan 4600; New York, Murray Hill 4-4037

Equine veterinary work is divided into many specialized fields, such as general farm practice, army service, light horse work, city and logging practice, and investigational research. Add to these breeding problems, manufacture of biologic products, teaching, and southern mule practice, and it will be seen what a varied industry this really is, and how complex.

* * * *

The oldest known method of preserving meat is to dry it in the sun. The Indians were preserving buffalo meat in this manner when the white man arrived on this continent. Adopting his methods "jerky", as sundried lean meat was called, became the principal reliance of the pioneers during seasons of game shortage. With the development of facilities for processing meat and for refrigeration (introduced to American meat packers by a veterinarian) the use of the sundried product practically disappeared from the United States. However, hundreds of millions of pounds of *xarque* (pronounced sharkey) as sundried beef is called there, are still used annually in South America. Its preparation is an important part of the business of South American meat packers—principally branches of our large packing companies.

"No cold is a slight cold," warns a New York physician, pointing out that pneumonia usually begins with a cold.—*S.N.L.*

* * * *

Heymann obstructed the common bile ducts of three dogs by double ligation and transection. The dogs were then given by stomach tube single doses of 200,000 to 250,000 U.S.P. units of vitamin D in viosterol or drisdol. In two normal dogs, doses of this magnitude caused pronounced increases in the antirachitic potency of the blood serum and definite increases in serum phosphate, showing that the vitamin D had been absorbed. In the three dogs with the obstructed bile ducts, however, no vitamin D could be detected in the serum and there was no increase in serum phosphate, thus confirming the conclusion of Greaves and Schmidt that in the absence of bile, vitamin D is not absorbed.

Heymann brings out that, according to this experiment, the non-absorption of vitamin D from viosterol in the absence of bile cannot be explained on the basis of interference with absorption of the oil which carries the vitamin, since the vitamin was not absorbed even when it was carried in propylene glycol. Therefore, bile appears to act on the vitamin D molecule itself, rather than on the solvent.—*Vitamin D Milk.*

A Small Animal Hospital

On the opposite page are several views of the animal hospital of Dr. George H. Ludins, Hartford, Connecticut.

The main thoughts in planning the building were convenience and ease in cleaning. It is a one-story brick structure, heated by hot water heat and an oil burner.

The waiting room, 10 by 20 feet, has a tile block floor over concrete, knotty pine walls, and a composition block ceiling. The furniture is maple with leather cushions.

The office, 10 by 20 feet, has textone walls and a tile floor over concrete.

The x-ray and drug room is 7 by 20 feet. The floor is concrete, with a center drain, and the walls are plaster.

The kennel room, 20 by 30 feet, contains 28 kennels 3 by 3 feet, and three 3 by 4 feet. This part of the building is fireproof. The walls are of brick and plaster, finished with waterproof aluminum paint, and the ceiling of plaster. The kennels have concrete bases 20 inches high, 1-inch slate partitions, and galvanized steel wire tops and front. Each has an individual drain and a removable maple slat floor. There are center drains in the aisles, so that the entire place may be pressure-hosed with hot water.

The concrete, drained exercise yard is 10 by 30 feet.

No contagious ward is included because contagious cases are not hospitalized.

Doctor Ludins, a graduate of Cornell University in 1924, came to Hartford in 1927. His first hospital was in a small store that he fitted up with some second-hand furniture. He stayed there two years, meeting with little success; then took his courage and persuaded a man who owned a lot in a good location to build him a hospital according to his specifications, signing a ten-year lease on the property. His business doubled the first month, and after five years he was able to buy the land and building. In the winter of 1936-37 he made several additions and alterations.

As might be expected, Doctor Ludins is a firm believer in the value of an attractive-appearing hospital in building up a veterinary practice. He writes: "I most emphatically believe that 'front' pays. Since we cannot advertise in any of the ordinary ways, and must depend entirely on what people say about us, it stands to reason that the more nice things they say, the better our business will be.

"I do not wish to minimize the fact that no amount of 'front' will replace ability. But if one has the ability, why make a mystery of it and hide it? You may take two equally bright lights, place one in a glass lantern, the other under a bushel—and then stand back and see which one attracts most attention!

"I say, 'Dress up.' Dress up yourself, your help, and your hospital. Make it just as good looking as your taste and your wherewithal will allow."

According to Doctor Ludins, a large investment in hospital and equipment pays in the long run. If one picks one's location carefully and builds wisely, adapting the prevailing type of architecture in the locality to one's individual needs, and subordinating the decorative to the practical, with provisions for further enlargement as necessity demands, Doctor Ludins says that one doesn't need to worry about the investment; that will take care of itself.

* * * *

According to a compilation, by the Michigan State Department of Health, of the 61 deaths in that state caused by milk-borne diseases in 22 years, all but four were traced to the use of raw milk.

* * * *

Dr. T. O. Booth, Chief Veterinarian of the Texas Livestock Sanitary Commission, in his speech before the fifteenth annual meeting of the Texas Public Health Association in Dallas, November 1, 1937, referring to tuberculosis, said: "The incidence in Texas is proportionately small, but the problem is by no means solved. The cooperative campaign for the eradication of tuberculosis is still in progress through which more than four million dairy cattle have been tested. Even though Texas is now in the modified accredited area, annual tuberculosis testing should be insisted upon by health authorities."

Diamond Jubilee of the A. V. M. A.

The seventy-fifth annual meeting of the American Veterinary Medical Association will be held in New York, July 5-9, 1938. Among professional organizations in this country, 75 years is a very respectable—a distinguished age. The American Medical Association, the daddy of them all, was but a stripling of 16 years when the national veterinary association was founded.

Naturally, an unusual effort will be put forth to celebrate the 75th anniversary of the founding of the oldest national veterinary organization in any English-speaking country and the largest veterinary organization anywhere. The birth of the association was in New York and there its 25th and its 50th anniversaries were celebrated. Now its 75th will go to the same city.

The occasion is an appropriate one for a brief, very brief, mention of the place of the great city in veterinary medicine. For more than a quarter of a century, New York occupied the position of unquestioned leadership in veterinary medicine and dominated veterinary affairs in this country. This position passed to agricultural regions with the declining numbers of horses in the city. In the early history of the United States as a nation, Philadelphia was its first city in population and in commercial and political importance. It divided leadership in education only with Boston. There the first veterinary books were published, the first veterinary schools were proposed and founded, and the first veterinary organization established. New York attained little importance in veterinary matters until the time of the Civil War, after which it quickly assumed leadership.

The early veterinary graduates to locate in New York were J. Clements (1804), C. C. Grice (1826), Henry Williams (1840) and C. Pilgrim (1843). All of these were from the London (later the Royal) Veterinary College. None of them contributed anything to the sum of veterinary knowledge or left any material record of themselves or their work. During this period (prior to 1850) and even down to 1875, the largest practices in New York were conducted by non-graduates. In the early 1820's, R. H. Budd, after a long apprenticeship with Bracy Clark of London, came to New York and established a large practice. He published (from Baltimore) a work on lameness of the horse in 1825. George Varnall came to New York in 1832 and began veterinary practice, which he continued for eight years. Returning to London in 1840, he entered the London college, was graduated and served on the faculty for many years, during which time he published some accounts of his experience in New York. The Lockharts, father, son and grandson, appear to have enjoyed large practices. Only the latter was a graduate (of Glasgow).

Early Veterinary Education in New York

In the '50's, Captain John Campbell Ralston, a retired British cavalry officer and a graduate of the London college, was practicing in New York and contributing frequent articles to the *Farm and Anvil*. He set about the organization of a veterinary college, which was chartered in 1857 as the New York College of Veterinary Surgeons. It did not function as a college until after the lapse of seven years and two reorganizations. By that time, Ralston was no longer identified with it. From it the four other veterinary colleges that have operated in New York developed directly or indirectly.

Early Veterinary Organizations

The first veterinary association established in North America was the American Veterinary Association organized at Philadelphia in 1854. Robert Jennings, Sr., was the motivating factor in the organization. The organization continued to hold meetings for a decade, but did not extend its influence beyond the environs of Philadelphia.

The second veterinary organization was the Boston Veterinary Society, established in 1858. C. M. Wood was responsible for its organization. It, too, remained local.

At the commencement exercises of his college March 4, 1863, Jennings proposed to Wood, who was present, that they combine their organizations at a meeting in New York City in an endeavor to make them national in scope. Wood was enthusiastic about the matter and after considerable correspondence, particularly with A. S. Copeman, then the leading practitioner in New York state, the project was agreed upon and a meeting called for New York City, June 9, 1863.

A factor that contributed much to the success of the project was a sudden governmental and public interest in veterinary medicine. At that time, the Army of the Potomac was requiring 500 horses per day for replacements and the Union Army in Tennessee, an additional 150. To make matters still worse, glanders was spreading to "every city and hamlet" from army animals and from horses sold to the civilian population by the army because they were no longer serviceable in the military service. Meyer, of Cincinnati, testifies to seeing several hundred such horses sold, one-third of which were suffering from clinical glanders at the time of the sale. Forty-one veterinarians from seven states attended the organizing meeting.

Several matters in connection with its organization are of interest. Among them may be mentioned the selection of the name. It was at first presumed that the name of the Philadelphia organization, American Veterinary Association, would be continued or American Veterinary Medical Association adopted (the meeting was opened by reading the minutes of the previous meeting of the A. V. A.) War psychology was responsible for the selection of "United States Veterinary Medical Association" as the name. At that time there were two organized governments within what is now the United States—the United States of America and the Confederate States of America. "American" was too inclusive for those who met in New York, who, of course, were all from the north.

Another matter of importance was the rise of Liautard. Dr. Alexander Francois Liautard, a graduate of the French school at Toulouse, had arrived in New York City in 1860 and had a practice which he tells us amounted to $4,000 yearly. He took an active part in the organization and since there was a difference of opinion as to whether Jennings or Wood should be made president, he was able to persuade those present that the association would get away to a better start with a graduate veterinarian at its head and J. H. Stickney, M.R.C.V.S., of Boston, was elected.

It was Liautard's first meeting with John Busteed, M.D. (chairman of the called meeting). Soon the New York College of Veterinary Surgeons was opened with Busteed at its head and Liautard supplying the clinic and teaching anatomy.

Jennings, Wood and Copeman, although self-taught, were competent, scientific men. All were prolific writers. Copeman was devoid of the strict regard for professional ethics that actuated Wood. Two other outstanding men who attended the meeting were Isaiah Michener of Pennsylvania and G. W. Bowker of Ohio; both self-taught.

But two papers were presented at the meeting. Both dealt with veterinary education—indicative of the change to come.

Although the reason for regarding the association organized in 1863 as a new one and not a continuation of the American Veterinary Association is understandable, one must still regret that the A. V. M. A. cannot date its birth nine years earlier.

Veterinary organization became popular in New York and within 25 years there were five veterinary associations in that city and Brooklyn.

Veterinary Practice in New York

Coming down to a later date, the earliest practitioner in New York now living is probably C. W. Crowley of St. Louis. Doctor Crowley was graduated from the American Veterinary College in its first class (1876) and remained in New York for a few years, first as assistant to Liautard, later to Lockhart. He made calls on horseback. His clients were farmers on Manhattan Island, and owners of cows in built up parts of the city, as well as the owners of city horses.

The Modern Stream-Lined Animal Hospital

By L. R. PALMER,
Gainesville, Florida

STREAM-LINED hospitals are relatively as desirable to-day as stream-lined automobiles and there are very good reasons why this is so. In the first place, running a hospital is for the welfare of the patients and to give them the best of care the caretakers themselves must be provided for and their comfort assured. All this can be accomplished in the stream-lined building with a minimum of effort and expenditure. There is no waste space used in corners or turns and used articles are arranged in easy reach. No overlapping of activities or passage routes are encountered.

BEGINNING with the front of the accompanying plan the route of the patient progresses from the reception room to the runs without as much as one overlapping step or the going through of a single room, nor has there been any waste space. From the reception room the patient can be taken into the operating or examining room, or if that is not necessary it can be taken directly to the runs or to a kennel.

In any case from the reception room, it is possible to go directly to the operating room, or the examining room, or a run or a kennel. This arrangement is not only convenient, time and effort saving but will often be found valuable in obviating encounters which might prove disastrous.

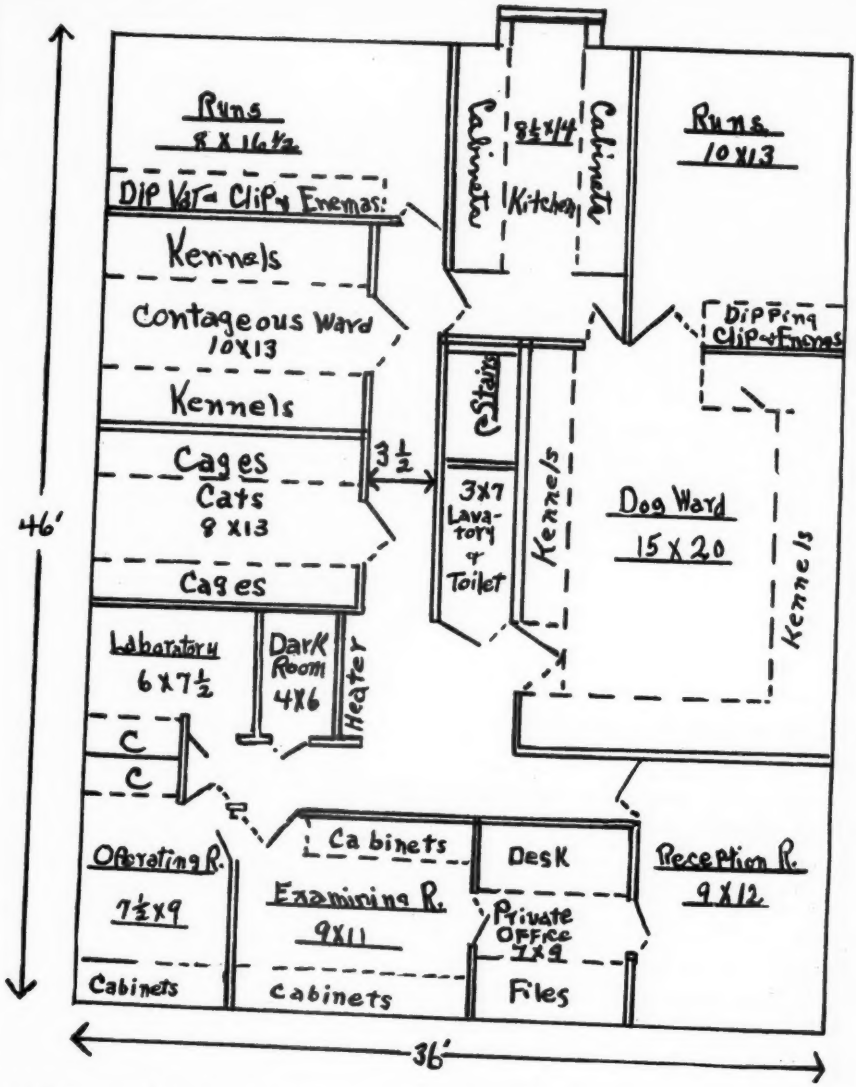
BETWEEN the reception room and the examining room, which in all probability will be used more than the operating room, the private office has been placed. Not that this is so very private as regards personal conferences which are very seldom needed other than in the examining room, but it is for the private work which the veterinarian must do in connection with the records and accounts of his business. Having this room located where it is allows whoever is in attendance to keep in touch with both the reception room and the examining room without having to run around to do so. The office is not to be used as a passage way from one room to another, the hall being designed for that; consequently the desk is placed across one end of the room, the files across the other end, and the doors are in the middle of the walls directly opposite each other. Whoever sits at the desk can see into either room or go into either room quickly at a moment's notice. This will be found a great convenience as anyone who has worked day after day in such work can testify. Cross ventilation through the doors and windows on the outside wall will provide plenty of air and light. And in winter unless there is a furnace in the building a grill through the wall into the hall will allow hot air to circulate into the room.

The arrangement of furniture in the reception room, examining room, and in the operating room has been left to the taste and requirements of the individual. There is plenty of wall space for cabinets, windows, and large pieces of furniture. Floor space is ample for operating tables, chairs, cabinets, and plumbing.

It may seem that it is an unnecessary expense to have both an operating room and an examining room but in practice, quite the reverse is found to be true. Aseptic conditions, which are necessary from a scientific standpoint, are also being expected and demanded by the general public. An operating room which is used for examinations, hallway, and storage room is not good practice or planning.

CONVENIENT to both operating room and examining room and accessible from the hall are the dark room and the diagnostic laboratory. The laboratory is large enough for such equipment as: the microscope, slides, plates, petri dishes, inoculating and test tubes, incubator, urinalysis reagents, blood testing equipment, and centrifuge.

Going directly into the hall, space has been left for a chimney. If the location is in the south a radiating heater can be set up here which because of its central location will heat the entire building. In this



case no basement is designed for the hospital but an attic partially or completely finished is planned to give storage space. But if the location is in a cold and dry climate where basements are practical, the basement will be found to be the better arrangement and a furnace would be placed there.

At this end of the hall and under or over the stair-way a small rest room is located. This will be found not only convenient but also a necessity in any building where clients bringing patients will want to clean up before leaving.

In the cat ward the principle of streamlining has been applied as far as possible. The room is no wider than necessary to take a door which is placed in the middle of the end wall and for kennels on either side along the long sides of the wall. If the

building is not air conditioned a window directly opposite the door and above the cages will provide air and light for this ward. The same is true for the contagious ward, which has been placed on this side of the building. If, however, a ward apart from the hospital is desired for the contagious cases, this ward and its accompanying run could be used for special patients, such as boarders, or convalescents.

IN THE kitchen, the principle of streamlining has again been applied as far as possible. The outside door has been placed in the middle of the wall space so that the cabinets can be arranged on either side along the walls. The doors leading to the large dog ward and to the hall to the other wards are conveniently placed. The stairs lead up or down as the case may be from the kitchen so that supplies entering from the service drive can be stored out of the way immediately.

The two runs are really out of the building but could be built as porches or enclosed as a part of the building. The floors of the runs should be of cement and the wall enclosure of such material that it can stand constant cleaning and furthermore look clean. The equipment for clipping, dipping, and enemas that is placed there should be stored in a suitable wall cabinet above the reach of dogs. The dipping vat and wash tub should have well fitting covers which will turn them into a work table when the vats are not in use. In cold climates this equipment may be placed in the basement.

The question of the best materials will in the end be governed by availability of supplies and climatic conditions. Masonry, which includes bricks, hollow tile, stone or cement in its various forms, all have good appearance and are substantial. If the builder can afford air-conditioning it would be a great help in keeping the pets warm or cool and the air pure. It is relatively new at the present time and liable to great modification in the near future. It is also rather expensive, however, several plans based on one method or another can be worked out which will give great satisfaction for the small additional expense. Air ducts at base and ceiling and at ridge pole aided by fans and blowers will lift the air and give a complete change as often as necessary. Cement or quarry tile floors and quarry tile baseboards should be installed in the beginning. If the kennels and cabinets are installed as a part of the building very little floor space and wall space is left to be finished off. Cement and quarry tile stand hard usage and clean well. Standing and walking on such floors will not be a hardship if rubber heels are worn on shoes and rubber mats are placed in front of work tables. The walls should be finished in washable paint. They may be of hard plaster, cement, or tile if tile has been used in the dividing partitions. In no case should cracks be left behind cabinets or kennels. Wood is not desirable material to use in a veterinary hospital. It absorbs odors and liquids easily and a permanent odor will cling about the building unless the wood surfaces are kept constantly painted with an impervious coating of paint. Cement or tile structures will need painting too but not as often nor as heavily as wood.

THE cost of the building will vary considerably with its location and with the local prices prevailing. Some contractors estimate the cost roughly on the number of cubic feet in the building, others on the square feet in the floor plan, then after the details have been worked out make a complete estimate from that. There are in this plan twelve rooms, bath, hall, and stairs. The floor plan contains 1656 square feet. The cubic feet would depend on the height of ceilings desired. If the building is air-conditioned the ceiling may be lowered considerably over present standard heights.

Aromatic spirits of ammonia will dissolve salicylic acid.

Correction

In the article on Equine Impactions by S. L. Stewart, May issue, the prescriptions on pages 245 and 246 should call for two ounces instead of two drams of dilute hydrochloric acid.

Leucemia in the Cow

By R. W. WANN, Manhattan, Kansas,
Kansas State College, Class of '38

A GRADE jersey cow (Fig. 1), six years old, was presented at the veterinary clinic of the Kansas State College October 18, 1937, with the history that two weeks previously she had gone off feed and the milk flow had decidedly decreased. The owner was also of the opinion that the cow's abdomen was increasing in size despite her inappetence and non-pregnant state.

The symptoms were emaciation, dehydration, enlargement of the superficial lymph glands and extension of head and neck to partially overcome the effects of pressure on the trachea due to enlargement of the submaxillary and retropharyngeal lymph glands.

The cow was kept under observation for six days before being destroyed. The temperature, pulse and respiratory rates were taken daily, and at no time were they above normal. Blood examinations were made daily. The averages over the six-day period were: white cells 47,416 per cubic millimeter, stabs 9%, segmenters 6%, lymphocytes 64%, neutrophils 11%, red cells 5,384,300 per cubic millimeter, and hemoglobin 6 (Hayden-Hauser).

At the end of the six-day observation period the cow had developed no new symptoms except that emaciation and extension of the head were more pronounced.

October 24, 1937, the cow was destroyed by cutting the posterior aorta through the rectal wall.

On autopsy the cow showed the following pathological changes: petechial hemorrhages very numerous in the subcutaneous tissue; all the superficial lymph glands enlarged to two or three times normal size; lymph glands, ordinarily almost imperceptible, very prominent.

The pharynx and larynx were somewhat compressed by the enlarged submaxillary (fig. 2c) and retropharyngeal (fig. 2f) lymph glands. The surrounding tissues were also edematous, swollen, and hemorrhagic.

The lungs were pale, poorly collapsed,

Fig. 1. Showing enlarged prescapular and precrural lymph glands outlined by clipping

edematous and contained "frothy" exudate in the bronchi. When incised the lungs presented numerous yellow streaks and patches of lymphoid infiltration (fig. 2b). The bronchial lymph glands (fig. 2d) were 4½ inches long, about three times normal size, and presented extensive hemorrhagic areas. The mediastinal lymph glands (fig. 2e) also were about three times normal size, measuring 8¼ inches long. When incised they presented extensive hemorrhagic areas.

The liver was approximately five times normal size, weighing 38½ pounds. It was greyish-red in color, friable and the edges were rounded as a result of extensive hypertrophy.

The spleen (fig. 2a) was approximately five times normal size, weighing 10½ pounds and measuring 31 inches in length. The edges were rounded as a result of extensive hypertrophy. On cross section the splenic pulp was dark red, soft, and easily scraped away with a knife.

The mesenteric lymph glands (figs. 2g and 2h) were approximately five times normal size, measuring five inches long; this explained the owner's belief that the cow's abdomen had been gradually getting larger.

The intestinal tract was normal except for the stasis of food due to dehydration.

Miscroscopically the following changes

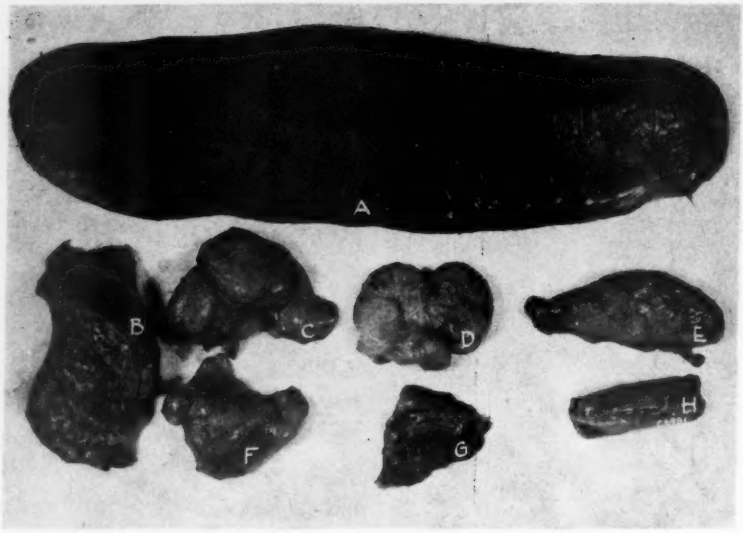


Fig. 2. Showing various organs revealing lesions of leucemia.

were noted: In the liver lymphocytic masses formed about one-half of the area of the section. The lymphocytes were fairly evenly distributed around the liver cells, interlobular veins and bile ducts.

In the lungs there were masses of lymphocytes around the bronchi and about one-third of the alveoli. A small amount of cellular exudate was also present in the smaller bronchi and alveoli.

The spleen was a mass of lymphocytes with little of the normal tissue markings left.

The lymph glands contained masses of lymphocytes and extensive hemorrhagic areas.

Diagnosis: Acute lymphatic leucemia.

THE etiology of acute lymphatic leucemia has never been determined, but it is thought to be of toxic-infectious origin. Some authorities are of the opinion that the underlying factor is a filterable virus as is the case of leucemia in poultry. Others are of the opinion that the condition is caused by an upset of the endocrine glands; this view is supported by the fact that injections of adrenalin excite the sympathetic system and produce leucocytosis.

Treatment of acute lymphatic leucemia is indicated only when for special reasons the life of the individual is to be prolonged. In human medicine the condition is treated with x-ray and radium irradiation in conjunction with arsenic to combat anemia. In veterinary medicine iron, quinine and arsenic are administered in the recommended doses for the species treated. The treatment adopted must be carried out over a long period of time, with an unfavorable prognosis.

* * * *

One part biniodide of mercury blister mixed with two parts iodine compound ointment will be found useful in removing many unsightly blemishes in horses or mules. With appropriate internal treatment, this combination works nicely on bony growths. It takes about twice as long as the undiluted blister, but causes less pain.

* * * *

In treating a case of impaction, always leave plenty of medicine to administer every few hours. This will keep the owner busy, and if it can be made up in the form of an electuary, the patient has a better chance to survive the treatment.

A Brief Consideration of Veterinary Diathermy

By WM. D. SMITH, Manhattan, Kansas,
Kansas State College, Class of '38

THERE have been many forms of electrical therapy machines devised from time to time. Many of these appliances have been developed only after a great deal of study and experimentation.

Perhaps the greatest number of electro-therapists have confined their efforts to some kind of high potential (high voltage), low amperage apparatus. The earliest type of importance was an electro-static machine with the Leyden jar condenser. Some of these machines may still be seen in some of the offices of the older physicians in small towns. The static machine was beneficial in the earlier days according to some authors, but with the development of the modern high-voltage auto-transformer the static machine became obsolete in a very short period of time.

At present, diathermy is being used extensively in human therapeutics for treatment of any condition for which heat is indicated. Very little has been done with diathermy, however, in the field of veterinary medicine. The purpose of this article is to point out the general indications and describe some of the fundamental principles.

Some of the following pathological conditions have been treated with varying degrees of success:

1. Localized infections.
2. Congestion of lungs.
3. Pneumonia.
4. Sprains.
5. Cancer.
6. Various inflammations including: (a) arthritis, (b) sinusitis, (c) cervicitis, (d) urethritis, (e) prostatitis and (f) nephritis.

Diathermy was first developed by d'Arsonval and Tesla as far back as 1890-91. Treatment of disease in man by diathermic application was begun in 1898.

Zimmern, of Paris, defines diathermy as follows:

"A form of thermo therapy which utilizes electrical energy for the production of thermal effects in the depth of tissue."

In 1910, Eugene Doyen described a method of treating cancer by electrically produced heat.

The fundamental principal of diathermy is comparatively simple. When electric current passes through any conducting medium, a certain amount of heat is produced. The amount of heat produced depends upon the strength of the current and the resistance of the conducting medium.

Because of the severe pain caused, it is impossible to raise the temperature of tissue by the use of ordinary continuous current. This is overcome by using high-frequency currents which alternate or reverse direction several thousand times per second. These high-frequency currents are used for diathermic therapy.

Since these alternating currents pass directly from electrode to electrode of the machine or generator, heat is produced in any tissue placed between these electrodes or in any tissue surrounded by an electrode. The deep as well as the superficial tissues are affected.

THE other methods of heat application in use, including hot packs, hot poultices, hot water bottles, ultra-violet light and infra-red rays, contact only the superficial structures. Any heat reaching deep tissues from such applications must travel by conduction to the deeper portions. Consequently, comparatively little heat is able to reach the deeper tissue.

Contrasting with the other methods named the heat of diathermy is produced directly in the tissue being treated. Since the currents must pass through the deep as well as the superficial structure the deep portion is equally benefited.

There is a localized internal heat.

It is perhaps well to summarize the action of heat on tissues.

1. Increased heat in living tissue results in active hyperemia. According to Bier an active hyperemia has the following effects: (a) analgesic, (b) bactericidal, (c) absorp-

tive, (d) solvent, and (e) nutritive.

2. There is, of course, an increase in metabolism.

THEORETICALLY, diathermy is an ideal method of producing hyperemia. The heat is generated in the tissues themselves and this heat can be confined to a given area.

There are two types of diathermy machines in use at the present time. One type has two separate electrodes, made from some flexible conducting material such as sheet tin or copper mesh.

The size and shape of these "pads" may be varied to suit the use and the patient or the portion of the patient being treated. It is necessary that the electrodes be thoroughly insulated to prevent arcing and the consequent discomfort to the patient.

The other type of machine has one long, continuous electrode which can be coiled about the part to be treated.

Both types of machine are equipped with milliampere meters or milliampere controls which indicate the amount of current passing through the tissue or part being treated. However, it is wise not to place too much dependence upon these meters. They indicate only very generally the amount of heat being produced since the heat produced depends not only upon the current, but also upon the kind of tissue through which the current is passing.

WHEN animals are being treated they must be closely observed, and any signs of discomfort must be noted, as severe burns can result.

It is also necessary that animals to be treated by diathermy be thoroughly clean and dry before the application of pads or electrodes.

A medium-sized male Airedale affected with posterior paralysis, a sequela of canine distemper, was treated with diathermy. The bladder was paralyzed and as a result it was almost impossible to keep the animal's hair and skin free from urine salts. All ionizable salts are ready conductors of electric currents, especially if damp or wet. In treating this particular case the electrodes were placed one on either side of the animal. The damp urine salts concentrated the current, and arcing probably was present also. A slough was produced because of a deep burn. This sloughing of tissue could have been prevented by drying the animal as thoroughly as possible and placing a dry folded towel between the electrodes and the flesh.

When proper precautions were taken, the diathermic treatment had a definitely stimulating effect on the dog. If treatment had been started before the animal became weak and debilitated, it might have been possible to save it.

When the internal organs are treated or when diathermic currents are passed through the body trunk, it must be remembered that the dense organs, such as the heart, liver and kidneys, are more readily affected, for these organs offer greater resistance to the passing currents, and more heat is generated. The temperature may become high enough to cause injury to the denser tissue. There are records of serious burns in these organs, especially the liver and kidneys, because of the ionizable salts present.

Following diathermy the rectal temperature often indicates a systemic rise in temperature which has been called artificial fever. This systemic rise results if an extensive area of the body is exposed to the passage of the currents. This type of "fever" is indicated in some widespread infections. There are many reports of successful treatment of gonorrhea and syphilis in humans by this method. There has been very little work of this type carried on in veterinary medicine, but it is reasonable to assume that similar results can be obtained against certain animal infections.

In very few cases is it advisable to place an electrode directly over the liver. The liver is not only a dense organ, but it contains a number of conducting salts. Since there are no dependable charts as guides for diathermy in animals it is impossible to know the temperature of a specific internal organ. Therefore, considerable care and judgment is necessary in the treatment of such cases.

Small weak animals should not be placed in the strong electrical field between the electrodes or pads of a diathermy machine. A small mongrel dog in poor general condition and showing symptoms of bronchitis and slight congestion of the lungs was placed between the electrodes of the machine. The intention was to relieve the congestion of the lungs and bronchial tubes. After about five minutes of treatment the dog became very weak and began to gasp. Although the current was immediately turned off, stimulants and artificial respiration failed to revive the animal. Cardiac failure had occurred at approximately the same time as failure of the respiratory system. Presumably the electrical field in which the animal was placed was responsible for blocking the circulatory and respiratory centers of the nervous system.

THERE is one additional precaution to observe in the treatment of all cases in which diathermy is used: never put an animal on a metal table while the machine is in use, since there are enough currents induced in the metal to cause excessive heat. Any metal that is in contact with the animal should likewise be removed (such as harness, collar, etc.). Metal buckles will become hot enough to cause superficial burns. The springs in beds have become hot enough to set fire to the bedding during treatment of human patients by diathermy.

THE use of diathermy in veterinary medicine is not widespread. There is, however, from work done at the veterinary clinic of Kansas State College, reason to assume that there are as many indications for its use in this field as in human therapeutics. The interest in this form of treatment is increasing, not only for local application to limited areas, but in general infections, where it is necessary to raise the entire body temperature. The success of diathermy in veterinary medicine at present depends entirely upon the judgment of the individual practitioner, for there are no data upon which he can rely.

Diathermy can be dangerous and overdoses should be guarded against until the operator becomes acquainted with his machine and its effect upon the different tissues. If the tolerance of the animal is not known, it is advisable to treat with low milliamperage over longer periods of time.

BIBLIOGRAPHY

American Medical Association. Handbook of Physical Therapy.

Bier, August. Hyperemia as a Therapeutic Agent.

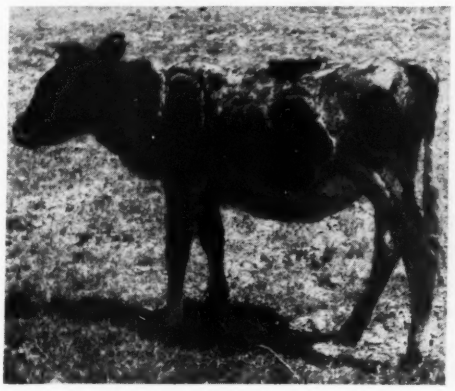
Corbus, Budd C., M.D. Diathermy in the Treatment of Genito-Urinary Diseases With Especial Reference to Cancer.

Groves, Burton Baker, M.D. Handbook of Electro-Therapy.

Houston, Edwin J., Ph.D., and A. E. Kennelly, Sc.D. Electricity in Electro-Therapeutics.

Sunburned Calf

During 1937 a mixed herd of cows and calves were affected by southern California's sunshine. The cattle were allowed to graze in an open field with no protection from the penetrating desert sun. The sun, however, was not entirely to blame. Burr



clover is thought to be responsible for sensitizing the animals to the strong light—hyper-photosensitization. Certain coloring materials in the clover cause the skin to become supersensitive to ultra-violet rays.

The cows were Holsteins and only the white part of the skin was affected. The division of the two colors was so prominent that it looked as though someone had taken a knife, cut around the black and peeled off the white, leaving the skin sore and scabby where the white hair had been.

M. W. BRADSHAW.

El Centro, Calif.

Preparation of Brucella Abortus Antigen and the Plate Agglutination Test

By E. LELAND LOVE, Manhattan Kansas,
Kansas State College, Class of '38

Introduction

Antigen.—Technically speaking, an antigen may be defined as any substance which, when injected into the body of a living animal, causes the production of antibodies. These antibodies are specific for the particular antigenic substance. With but few exceptions, antigens are proteins.

Bacterial Antigen.—This is a suspension of specific organisms in a suitable medium. It includes the bacterins and vaccines, the former being a suspension of killed organisms, while the latter contains live or viable organisms.

Veterinary Antigens.—Specifically, these include those used in the diagnosis of specific diseases as Salmonella pullorum, swine erysipelas, Bang's disease, etc. An antigen is also used in conducting the complement fixation test in the diagnosis of such diseases as anthrax, botulism, dourine, glanders, Bang's disease, and many others. Limiting this paper to a specific antigen, we shall consider only the *Brucella abortus* antigen which is used in the diagnosis of Bang's disease. This antigen may be defined as a suspension of killed *Brucella abortus* organisms in 0.5% phenolized physiological salt solution (0.85% NaCl). The antigen may be suspended in a 12% NaCl suspension.

Preparation of Beef-Liver Infusion Medium

One pound of beef-liver, free of fat, internal vessels, connective tissue and the external capsule, is ground or finely chopped. To this is added 500cc of tap water, and the mixture is placed in the cooler for 24 hours. The cooling facilitates hydrolysis of the liver cells. At the end of the 24-hour period the mixture is placed in an open steamer or an Arnold sterilizer for 1½ hours. The container should be removed at 30-minute intervals and the mass broken down, since otherwise the internal part would not be thoroughly exposed to the heat, and the amount of nutrient material to be expressed from the liver would be correspondingly limited. The contents are then filtered through gauze, and the filtrate is placed in the cooler to permit any fat present to solidify. It is then again filtered through a thin layer of cotton, to remove the fat and fine parts of the liver tissue that passed through the gauze. The final filtrate, known as beef-liver infusion, is made up to 1000cc with tap water. To this 1000cc of beef-liver infusion are added:

Peptone, C. P.	15gm
Glucose (dextrose), C. P.	10gm
Sodium chloride, C. P.	5gm
Glycerine, C. P.	10cc
*Agar-Agar	25gm

* Add 30 grams if Roux flasks are to be used.

The mixture is then placed in an Arnold sterilizer until all the ingredients are in solution, when it is removed and cooled to 60°C. It is now ready for titration; that is, bringing it to the proper pH value (hydrogen-ion concentration). Two methods are commonly used in this determination; namely, the potentiometer and the colorimeter. Both methods are satisfactory; the second method will be discussed here.

Technique for Titration

Place 8cc of warm pH 7.0 distilled water in each of the three front tubes in the colorimeter block.[1] It is necessary that water be used to dilute the agar medium; otherwise it would solidify, preventing the mixing of the brom-thymol blue indicator. To each of the tubes containing 8cc of distilled water add 2cc of the beef-liver infusion agar medium. To the central tube add 0.8cc of a 0.02% aqueous solution of brom-thymol blue. If the medium is acid or has a pH below 7.0, the color will be yellow. To get the proper pH in the indicator tube, it is usually necessary to add an alkaline solution, or N/20 NaOH. Enough of this solution is added to change the color from yellow to that corresponding to the pH 7.2 tube, or a greenish-blue. Suppose it re-

quires 0.5cc of N/20 NaOH to bring the 2cc of medium to pH 7.2, then how much N/1 NaOH will be required to bring the 1000cc of medium to pH 7.2?*

$$0.5 : 2 :: X : 1000$$
$$2X = 500$$
$$X = 250$$
$$250 \div 20 = 12.5$$

Therefore it would require 12.5cc of N/1 NaOH per 1000cc of medium.

When this is added and thoroughly mixed a re-check is made to eliminate a possible error.

The medium is now ready to be placed in Roux flasks in 100cc amounts, and in culture tubes in 6cc amounts. The flasks and tubes, properly plugged with cotton and under a paper cover, are then sterilized in the autoclave for 45 minutes at 15 pounds pressure. The final pH after sterilization will be 7.0. It is advisable not to raise the pressure too rapidly, since the plugs might be forced into the flasks or tubes. At the end of the sterilization period the pressure should be released very slowly, otherwise the plugs may be blown out, or the contents boil up on the plugs. After removal from the sterilizer the flasks should be laid on the flat side, while the tubes should be slanted at a 30° angle to solidify.

Methods of Testing the Suitability of Cultures for Antigen Production

1. Macroscopic and microscopic examination.
2. Fermentation.
3. Animal inoculation.
4. Comparing the antigen against a known antigen.
5. Checking the antigen against known positive and negative sera.
6. Thermo-stability.
7. Agglutinability.

Preparation of Brucella Abortus Antigen

Stock cultures used in the preparation of antigen are transferred semi-monthly on pH 7.0 media. At the time of the regular transfer two slants are inoculated from each of the strains of *Brucella abortus* culture from which the antigen is to be made. The stock cultures are replaced in the cooler. The inoculated slants, properly labeled, are placed in the incubator for 48 hours at 37.5°C. The slants are then removed. One set of the cultures is placed in the cooler and carried as stock cultures until the next regular transfer, two weeks later. The slants of the other set are immediately sub-cultured and given the same incubation time as before (48 hours at 37.5°C.). From these a second sub-culture is made of each strain onto several slants, and these are incubated as before. The number depends upon the number of Roux flasks to be inoculated. At the end of this time approximately 5cc of sterile, 0.85%, NaCl solution is added to each slant under aseptic conditions. The bacterial suspension of each slant is transferred to a separate Roux flask. The bacterial suspension and the water of condensation of the Roux flasks are thoroughly mixed, and by tilting the flasks (medium side down) the entire surface of the medium will be covered. The flasks are then placed, medium side down, in the incubator at 37.5°C. for 12 hours; this permits a more thorough fixation of the organisms to the media. They are then turned over (medium side up) for 60 hours.

Seventy-two hours incubation gives a maximum growth. Longer incubation tends to cause the organisms to dissociate or become "rough". Such an antigen would be characterized by spontaneous agglutination, which in all cases must be guarded against.

At the end of the 72-hour period the flasks are removed from the incubator and carefully examined macroscopically for contamination and atypical growth. Any such flask is immediately discarded, no matter how slight the degree of contamination or atypical growth. Just enough sterile 0.5% phenolized physiological salt solution is added to each flask to cover the bacterial growth. It usually requires from 20 to 40 minutes for the bacterial growth to be released from the medium by soaking. This time factor depends somewhat upon whether or not the suspensoid is agitated upon the medium. A microscopic examination is then made of the bacterial suspension of

* It is advisable to use N/1 NaOH instead of N/20 NaOH to 1000cc since the latter would dilute the medium too much. N/20 NaOH is used in the trial titration of the 2cc since chances of error are less than when using an N/1 NaOH on such a small quantity.

each flask to check further for contamination and dissociation. This is done by placing a small loop-full of the suspension mixed with a small amount of sterile distilled water upon a clean, dry slide and staining by Gram's method. Again flasks showing contamination or dissociation are discarded. The contents of those flasks that have passed the macroscopic and microscopic examinations are then filtered through a thin layer of cotton into a large flask, and the pooled bacterial suspension is slowly boiled over a bunsen burner for 10 minutes. (Boiling does not decrease the sensitivity of the antigen, but it does protect the technician in handling it. Boiling also tends to coagulate proteins in the suspension.) The flask is then placed in the cooler for 12 hours, after which the suspension is again filtered through sterile cotton into a sterile flask. This filtration removes the coagulated proteins, etc.

The organisms are now ready for the washing process. The suspension is placed in 50cc centrifuge tubes and centrifuged at 3600 r.p.m. for one hour, or until all the organisms have been thrown to the bottom of the tubes. The supernatant fluid is discarded, and a small amount of sterile 0.5% phenolized 0.85% NaCl solution is added to each tube. A thorough mixing is accomplished by drawing the fluid into a 10cc pipette and forcing it out again by means of a large rubber bulb on the pipette. An atomizer bulb works nicely for this purpose. When the process is completed the bacterial suspension is again filtered through sterile cotton into a sterile flask.

Standardization

The final antigen should be properly standardized according to the density, or the comparative number of organisms per cubic centimeter of antigen. The density of a rapid-method antigen does not affect greatly the agglutinability or sensitivity. It does, however, aid in reading the test. Therefore, the most important thing to consider is that the density should be adjusted to suit the eye of the technician who reads the test. We have found the following most satisfactory: 0.5cc of the suspension is placed in a Hopkins tube and centrifuged at 2000 r.p.m. for 75 minutes. The column in the narrow portion of the tube should measure ½ of an inch. Suppose on the first trial the column measured ⅝ of an inch. This would indicate that the antigen is too dense, since the column is ¼ longer than ½ inch. Assuming that we are standardizing 1000cc of antigen, we should add 125cc of sterile 0.5% phenolized 0.85% NaCl solution to the 1000cc of antigen. On the other hand, suppose the column measured only 7/16 of an inch, indicating that the antigen is too dilute and must be concentrated:

$$\text{Then } 8/16 - 7/16 = 1/16$$
$$1/16 \times 1000 = 62.5$$

Then 62.5cc of fluid must be removed from this antigen. This necessitates centrifuging the antigen in 50cc tubes, removing 62.5cc of the supernatant fluid. The organisms are then mixed with antigen from the original suspension. In either case a double check is made on the antigen by the Hopkins tube method to assure the accuracy of the final reading. The antigen should have the same density as the preceding batch of antigen which was made according to the standard.

At this time dyes may be added to the antigen. Since the only preservative we have added so far is the 0.5% phenol, it might be advisable under certain conditions, such as high temperature, to further preserve the antigen. It has been found that gentian violet in the dilution of 1 to 25,000 and brilliant green in the dilution of 1 to 20,000 are effective in preventing the growth of gram-positive and -negative organisms.

When the density has been established the antigen is placed in sterile amber bottles with rubber stoppers and placed in the cooler at a temperature of 34° to 40°F. It is advisable that the antigen remain there from three to five days to allow proper spacing of the organisms.

Methods of Checking Suitability of the Final Antigen

1. Microscopic examination for purity and morphology.

2. Checking against the previous batch of antigen.

3. Checking against known positive and negative sera.

4. Thermo-stability.

Characteristics of a Good Antigen

1. Reactions should break sharply at the specific dilution.

2. It should not show paradoxical reactions.

3. It should give clean-cut positive and negative reactions.

4. It should be stable.

5. It should show no evidence of spontaniety of reaction.

Technique for Making the Test

The equipment consists of a glass plate ruled into squares, a test box, pipette dropper graduated in thousandths of a cubic centimeter, and applicators.

The antigen is placed on the cool plate in the proper amounts followed by the proper amounts of serum. The two are thoroughly mixed, a separate applicator being used for each test. Mixing is from the highest dilution toward the lowest dilution, to avoid carrying serum by means of the applicator to the higher dilutions. It is not advisable to run more than ten or fifteen tests at one time, since exposure to the air results in evaporation. Where the dropper is used, it is thoroughly washed after each test.

After the plate is prepared, it is gently warmed and placed in the test box from seven to ten minutes at 37.5°C. Best results in reading are obtained over an indirect light.

The standard dropper delivers .04cc.

A *negative reaction* indicates that the animal is not infected or harboring the Bang's organisms. However, a cow recently infected might give a negative reaction, and after several weeks become positive.

A *suspect*, as shown in the tables, carries an intermediate reaction. The stage of pregnancy and incubation must be considered in interpreting such a reaction. A cow previous to, or shortly following, parturition may give a doubtful reaction, and a few weeks later a positive reaction.

According to C. H. Kitselman's report[2] 61.1% of the cattle which reacted in a dilution of 1/50 became definitely negative and 23.1% became definitely positive in a dilution of 1/100 or higher, whereas 16.8% remained unchanged. These data were obtained on 1000 cattle over a five-month period.

Factors Influencing the Test

1. Mechanical: freezing or overheating of the blood samples, drugs, disinfectants, water, etc., in sample bottles into which the blood is drawn.
2. Stage of pregnancy.
3. Time of incubation of test.
4. Temperature of incubation of test.
5. Age of antigen.
6. Accuracy in making the test.

Reasons for Variation of Laboratory Reports

1. Failure to correlate the test with the stage of pregnancy.
2. Human error in reading the test.
3. Non-uniformity of antigens.
4. Hemolyzed or spoiled samples.

Methods for Making the Dilutions

Antigen	.04cc	.04cc	.02cc	.01cc	.005cc
Sera	.08cc	.04cc	.04cc	.04cc	.04cc
Dilution	1/25	1/50	1/100	1/200	1/400
OR					
Antigen	1 drop	1 drop	2 drops	4 drops	8 drops
Sera	2 drops	1 drop	1 drop	1 drop	1 drop
Dilution	1/25	1/50	1/100	1/200	1/400

Interpretation of the Test

No agglutination	negative
Agglutination, 1:25	"
" 1:50 I*	"
" 1:50	suspect
" 1:100 I*	"
" 1:100 and up	positive

*I—Incomplete reaction.

REFERENCES

1. Mendalia, Leon S. Color Standards for the Colorimetric Measurement of H-ion Concentration. *Jnl. of Bacteriology*, Vol. V, No. 5, pp. 441-468.

2. Kitselman, C. H. 1936. *Jnl. A.V.M.A.* Vol. LXXXIX, NS 42, No. 6.

Ketosis in Cattle and Sheep*

By J. SAMPSON, Urbana, Illinois,
Assistant Animal Pathologist,
State Department of Agriculture[1]

Clinical ketosis in cattle and sheep is apparently restricted to the disorders known as acetonemia of cows and pregnancy disease of ewes. Acetonemia and pregnancy disease may be defined as disorders of metabolism characterized by ketosis and hypoglycemia. It is also apparent that acetonemia of cows and pregnancy disease of ewes are common and widespread maladies. In cows there is a pronounced decrease in milk production, together with rapid loss of condition and presumably low mortality in contrast to more than 90% mortality of ewes after clinical symptoms are displayed. The economic importance of this syndrome in many herds and flocks may, therefore, become highly significant.

Acetonemia is found primarily in cows of the dairy type. It occurs independently and sometimes as a complicating condition of other diseases. Cows of all ages and of all breeds may suffer repeated attacks. Although it may develop during pregnancy, it is observed most frequently any time during the first to the sixth week after parturition. In lactating animals it is largely restricted to the high-producing cows in the herd. These cows are often in good flesh at the onset of an attack. Ewes in good flesh may be affected with pregnancy disease, but the disorder is most often observed in flocks in poor condition or in only medium flesh. Both native and western ewes are susceptible. Clinical symptoms of pregnancy disease usually develop from four to three weeks up to a few days before lambing. Affected ewes generally carry twins or triplets, but it nevertheless occurs not infrequently in ewes with single lambs.

A consideration of some of the specific demands for carbohydrate and the physiological changes that are believed to be involved in carbohydrate-fat metabolism may serve to explain in some measure why an intense ketosis may develop in pregnant or lactating cows or in pregnant ewes and rarely, if at all, in non-pregnant, non-lactating females and in steers, bulls, wethers, and rams. Clinical observations indicate that ketosis apparently does not occur in lactating ewes, but it is not unreasonable to assume that the condition might develop in a ewe that is a high producer.

During pregnancy and the first few weeks after parturition (when milk production usually reaches a maximum) there is a constant and growing demand for glucose (carbohydrate). Relatively large amounts of carbohydrate, in the form of glycogen, are stored principally in the liver and in the muscles of the fetus. In a lactating animal, carbohydrate is probably the main source of sugar (lactose) in the milk. It is the glucose carried in the blood that is drawn upon primarily to supply these requirements. Non-pregnant, non-lactating cows and ewes, and steers, bulls, wethers, and rams do not have these special and peculiar needs for carbohydrate. Furthermore, the ability of the mature ruminant to store a readily available supply of carbohydrate in the body as glycogen appears to be limited. This has been proved experimentally for the sheep. It is not surprising, therefore, that a disorder of carbohydrate-fat metabolism is more likely to develop in pregnant and lactating cows and ewes than in the other classes referred to in this discussion.

The ketone bodies (acetone, CH_3COCH_3; acetoacetic acid, CH_3COCH_2COOH; beta-hydroxybutyric acid, $CH_3CHOHCH_2COOH$) are intermediate products of fat metabolism and are believed to be formed chiefly in the liver. Normally, these chemical substances are changed almost completely to carbon dioxide and water. The conversion of the ketone bodies to carbon dioxide and water appears to require the combustion of carbohydrate. If a sufficient quantity of carbohydrate is not available

*Presented at the 1937 Annual Meeting of the Eastern Iowa Veterinary Association, Cedar Rapids, October 12-13, 1937.

1 Assigned to the Division of Animal Pathology and Hygiene, University of Illinois.

for this purpose or if there is some impairment of its use, as in diabetes, fat metabolism tends to result in ketosis. The ketone bodies are toxic and when concentrated in the blood and tissues may produce a state of intense acidosis (lowered alkalinity).

Most forms of treatment that have been tried for pregnancy disease in ewes have not been successful. Promising results have been obtained by the use of dextrose sugar. For this method to be successful it is essential that the treatment be started just as soon as the first symptoms of dullness and weakness are observed. From 250 to 500cc of a 25% solution, one-half intravenously and one-half subcutaneously, is a satisfactory dose. In some instances it may be advisable to use a smaller dose. The dextrose solution should be given daily. In many cases it is more advantageous to administer one-half to one pound of either corn sugar (dextrose), molasses, or brown sugar dissolved in water by a small stomach tube or in a drench. Best results are presumably obtained by administering the sugar in several doses. If anorexia is not complete, the dextrose or other concentrated carbohydrate may be fed with the grain portion of the ration. The object of the treatment is to furnish a readily available supply of glucose (dextrose).

Dextrose therapy is the preferred treatment for acetonemia in cows. Approximately 500cc of a 40 to 50% solution administered intravenously and subcutaneously has been found to be a convenient dose. A number of daily injections are often necessary. Dextrose, combined with calcium gluconate, is apparently effective for acetonemia associated with milk fever. The diagnosis should be the basis for the type of treatment used in other complicated forms of the disorder. Chloral hydrate, used alone or in conjunction with dextrose solution, is also effective in overcoming ketosis in cows. It is not indicated in acetonemia associated with milk fever, especially during the paralytic stage (Fincher, 1936). Ten to 30 grams, given twice daily, either in capsule, in a drench, or in a pint each of molasses and hot water by a stomach tube, is the recommended dosage. The number of doses required varies with the intensity of the attack. The hazard involved in chloral therapy has discouraged its use for pregnancy disease in ewes.

A positive test for abnormal amounts of ketone bodies in urine from cows and ewes is almost pathognomonic of acetonemia and pregnancy disease. It should be borne in mind that normal urine from pregnant or lactating cows and ewes may contain sufficient ketone substances to give a slightly positive reaction to any of the qualitative tests. The reaction is so intensely positive in clinical and subclinical cases of acetonemia and pregnancy disease that the clinician soon learns to make the correct interpretations. The Ross Modification of Rothera's nitroprusside method, first suggested by Dr. C. E. Hayden for use in the field, is a highly satisfactory test. The details of this test have been published repeatedly and need not be repeated here. All the veterinary supply companies list the reagents necessary with directions for their use.

Some cows and ewes seem to develop ketosis more rapidly than others and it is thus questionable whether any ration, when uniformly fed, will prevent an attack in certain individuals. It is not unlikely, however, that the number of cases can be greatly reduced and the intensity of the attacks ameliorated by feeding rations that are rich in concentrated carbohydrates during the last few weeks of pregnancy and the first six to eight weeks after parturition. Such common feeds as corn, oats, and bran are relatively rich in concentrated carbohydrates. If ketosis develops in a herd of cows or in a flock of ewes that are being fed a liberal grain ration it is suggested that the daily amount of concentrates be supplemented by the addition of either corn sugar (dextrose), blackstrap molasses, or brown sugar (¼ to 1 pound per ewe; 2 to 4 pounds per cow).

Veterinarians recognize the importance of exercise during pregnancy. Pregnant ewes are not an exception and should have a moderate amount of exercise away from the sheds every day that weather conditions permit.

Dystocia Followed by Metritis and Eclampsia

A scottie that had been in labor for 12 hours was brought to me Feb. 8, 1938. During the first six hours she had had three puppies, one of them almost dead and the other two in fine condition. The bitch was still having periodic labor pains, but they were very weak. On examination there was one puppy high up in the left horn. I gave her 1cc of pituitary extract with no results, and repeated the dose 30 minutes later, but did not set up enough labor pains to move the puppy a particle; I therefore delivered it with forceps. It was dead.

A close watch was kept on the bitch. For a time her progress appeared normal; the night of Feb. 11th her temperature was 101.5°F. The next morning, however, she was very sore in the right hind leg and had a temperature of 105°F. There was some pus in the vaginal discharge which had not shown up before. At noon she was almost in convulsions, with temperature still at 105°F.

My first diagnosis was metritis, but when the convulsions came on I considered the possibility of eclampsia.

Treatment.—In the morning I gave 15 grains of sulfanilamide, continuing with 10 grains every four hours until she had received 45 grains. At noon, when the symptoms of eclampsia appeared I administered 30cc of 24% calcium gluconate intravenously. I left the puppies with her, since there were only two of them. That evening her temperature had dropped to 104°F. and she seemed to be partially paralyzed all over. I therefore removed the puppies and the next morning the bitch was able to be up and walk about a little. Her temperature was then 103°F. I put the puppies back with her, and by noon she was down again. This time I gave her 40cc of 24% calcium gluconate intravenously, maintained 30 grains of sulfanilamide daily and kept the puppies away from her altogether. I also used an ounce of B.I.P. in the uterus once a day.

On the evening of Feb. 13th, she was walking around and barking at the other dogs. From then on she made an uneventful recovery, and was discharged on Feb. 19th.

This was my first experience with eclampsia within two to three days after whelping.

D. M. HOWARD.

Augusta, Ga.

* * * *

Enlargement of the Lacrymal Caruncles

The patient, a two-year-old bay gelding weighing 1200 pounds, was presented at the veterinary clinic of the Kansas State College on November 1, 1937, for treatment for bilateral lacrymal discharge. The condition was of about two months duration. Extensive inflammation was not present in both eyes. The medial canthus of each eye showed signs of slight irritation by the presence of round red structures about the size of a dime. On close observation these structures were found to be the lacrymal caruncles enlarged to about double normal size. Anatomically the lacrymal caruncle is located in the medial canthus of the eye in the lacrymal lake. It is in contact with the membrana nictitans posteriorly, and it is between the medial parts of the upper and lower eyelids. The structure is normally pea-sized, pigmented, and provided with a number of small hairs which project from its surface.

The condition had come on during the latter part of August, when the weather was windy and dry. It is thought that the dusty atmospheric condition caused a local irritation in the region of the lacrymal caruncles, resulting in their enlargement. Subsequent friction with adjacent sensitive mucous membranes and possibly misdirected hairs of the lacrymal caruncle, account for the continued lacrymal discharge.

Complete surgical removal of the offending structures was advised. The mucous membranes around the lacrymal caruncles were anesthetized with an application of 2% butyn ointment, allowing 15 minutes for local anesthesia of the tissues to take effect. The patient was restrained in a

standing position in the stocks. The head was tied in a fixed position to prevent accidental injury of the cornea with cutting instruments during the delicate operation. The lacrymal caruncles were grasped with a pair of narrow-jawed hemostats and traction applied. Exercising care not to dissect too deeply, the operator removed the structures completely with a small pointed blade bistoury. Very little hemorrhage resulted from the operation. Close examination of the structures after removal showed them to be distorted and rough, with hairs entangled and pointed in various directions. The nasolacrymal ducts were irrigated thoroughly and the patient was released.

In about six weeks the animal was reexamined to check the degree of success of the operation. The surgical area was healed completely and the lacrymal discharge had ceased.

G. D. Bowers, K. S. C., '38.
Manhattan, Kans.

Maurice Crowther Hall

Veterinarians not only in America, but all over the world, will be shocked to learn of the sudden death of Dr. Maurice C. Hall, Washington, D. C., following an operation at Walter Reed Hospital, May 1.

Doctor Hall was one of the very ablest veterinarians America has produced. In this country he was known and esteemed by veterinarians, physicians, zoölogists and all others having to do with the biological sciences, for his many scientific attainments. In other lands his reputation will rest on his preëminence as a parasitologist.

Born in Colorado in 1881, Doctor Hall obtained his academic training in that state. Later he was graduated with the degree of M. A. in zoölogy from the University of Nebraska, and subsequently, with the degrees of Ph. D. and D. V. M. from the George Washington University; but his accumulation of knowledge never ceased. For example, as a part of his scientific training, he acquired proficiency in nine foreign languages.

Entering the Bureau of Animal Industry of the U. S. Department of Agriculture in 1907 as scientific assistant in zoölogy, Doctor Hall rose to the position of chief of the Zoölogical Division of that bureau, a post he held for eleven fruitful years, until in 1936 he became head of the Division of Zoölogy for the National Institute of Health for the U. S. Public Health Service. His tenure of office in the Bureau of Animal Industry was interrupted by two years spent in the research department of Parke, Davis & Company of Detroit, and a year and a half in the Veterinary Corps of the Army during the World War.

During the time that he was chief of the Zoölogical Division of the B. A. I., Doctor Hall made many parasitological surveys, not only in the United States, but in Hawaii, Central America and the West Indies, which added tremendously to the information available concerning the incidence of parasitisms, and throughout that period he carried out or directed scientific research upon which much of the present knowledge of parasite control in both animals and humans (he proposed the carbon-tetrachloride treatment for hookworm in man) is based. He also administered the Bureau's parasite control projects; often spending weeks in the field in immediate charge of the work. Thus parasite control measures he developed always had the merit of practicability.

He was president of the American Veterinary Medical Association in 1930-31 and in that capacity visited a large number of state and other veterinary association meetings, contributing liberally to the programs. His speeches on those occasions will be long remembered for their interest, clarity and scientific value. He was the author of more than 300 books and articles on parasitology and related subjects, and not a dull one among them. The files of Veterinary Medicine contain hundreds of pages from his pen. An excellent public speaker, among the best as a scientific writer, a capable executive and a brilliant conversationalist, Doctor Hall will be missed in scientific circles as few have been.

The deceased is survived by his widow (*nee* Lola Davis) and three daughters.

Dog and Cat Fleas

By J. A. FARNEY, Manhattan, Kansas,
Kansas State College, Class of '38

DOGS and cats are most commonly infested by two very closely related species of fleas, which appear to feed more or less interchangeably on the two hosts, as well as occasionally on man and other animals. These two species are known scientifically as *Ctenocephalus canis* and *Ctenocephalus felis.* Two other species that also attack dogs and cats are *Echidnophaga gallinacea,* the "stick-tight" flea of poultry, and *Ceratophyllus fasciatus,* the rat flea which is the common intermediate host of bubonic plague.

FLEAS affect man and animals in two ways: first, as disease carriers, and second, as parasites or annoyers of their host. Fleas are known to transmit the human plague bacillus and are thought to transmit a disease known as infantile kala azar, occuring in the countries bordering the Mediterranean Sea. Because of their habits it seems quite possible that fleas may spread rabies and other virus diseases, or even microfilaria. *C. canis, C. felis* and the human flea, *Pulex irritans,* are intermediate hosts of the tapeworm *Dipylidium caninum.*

The ripe segments of the tapeworm are voided with the feces, or they may leave the host spontaneously. In the latter case the segment may crawl about actively, disseminating its eggs as it moves along. The larvæ of the fleas become infected by swallowing the eggs, and the cysticercoids develop after the fleas have reached the adult stage. The final host acquires the parasite by swallowing the infected flea. Human cases, which occur mainly in young children, are probably due to the accidental ingestion of such fleas when the children play with dogs or cats.

While plague can be transmitted from animal to animal through ingestion of infected food or water, the common mode of transmission is by means of the flea as an intermediate host. The latter becomes infected when it draws blood from an infected animal. When its host dies, the flea soon leaves it and seeks another. The bacteria ingested multiply enormously in the flea's digestive tract and are deposited on the skin of the new host, either animal or man, in the feces or regurgitated material deposited by the flea near the point of bite during the period of feeding. Infection can occur through the wound made by the bite or subsequent scratching.

The annoyance often makes the host irritable and cross, which is especially objectionable in the case of pets. In the case of valuable dogs and cats it is desirable to rid them of fleas, and in all cases where these animals are closely associated with man the control of the fleas upon them is of importance. Quite often dogs and cats are worried so much by fleas that they become restless, lose condition, and spoil their coat by biting and scratching. The biting and scratching of the skin often predisposes the animal to other types of infection or infestation. The fleas suck blood and produce very irritating bites. It is not uncommon in bathing a dog heavily infested with fleas, to have the water red with blood from the flea bites. When feeding, the fleas inject a salivary secretion which tends to produce inflammation at the site of the puncture. Usually the bites result in small inflamed spots, but occasionally, where the pests are very numerous, or in the case of susceptible individuals, more general inflammation may occur, sometimes followed by swelling and, especially after scratching, by ulceration.

THEODORE PERGANDE, working with the dog flea at Washington, D. C., found the life cycle from egg to adult to be completed within 17 to 37 days. It is thus seen that a great number of fleas might be produced in and beneath an unoccupied house in a comparatively short period. The life of the flea has four distinct stages: egg, larva, pupa, and adult. Up to 20 eggs are

deposited by the adult female flea. These are deposited in dust or dirt, or are laid on the host, but soon drop off as they are not sticky. The eggs are cream-colored or white, and ovoid. The larvæ may hatch from 2 to 16 days after the eggs have been laid, depending on the temperature and humidity. The larvæ have masticatory mouth parts and feed on small amounts of dry blood, feces and other organic matter. In from 7 to 10 days, or longer, they spin a cocoon in which the pupal stage is passed. The pupal stage may range from three days to more than a year. During the summer the average longevity of the dog flea is probably a little less than two months.

As has already been shown, the eggs either are laid away from the host or else fall off immediately. Therefore, to satisfactorily treat with the flea, it is necessary not only to kill the adult fleas on the dog or cat but also to destroy their breeding places and the immature stages. This, of course, can be accomplished by the application of proper sanitary methods in the kennels or sleeping quarters, and the repeated killing of the adult fleas on the dog or cat.

THERE are many and varied methods of repression of fleas, each of which has its advantages and disadvantages. Powders have a limited use, but sometimes they can be used advantageously in cold weather where the animal cannot be thoroughly dried or kept warm after being washed with the liquids, or in certain diseases where bathing is countraindicated and the fleas are causing irritation.

Experiments with the use of the powdered roots of certain tropical plants known as derris show that this drug when fresh is exceedingly effective in destroying fleas on animals. All fleas on a small dog can be destroyed by the application of one gram, or about three-fourths of a level teaspoonful of the powder. It is suggested that the material be mixed at the time it is used with two parts of flour or cornstarch and dusted into the hair of the animal, especially along the back and neck, with a shaker. If the animal is exposed to infested premises and becomes reinfested, treatment should be repeated at intervals of 10 days.

Where the liquids can be used, they have many advantages over the powders. They can be applied more thoroughly and easily. Among the many liquid preparations are pine oil disinfectant, rotenone, creolin and commercial ether.

PINE oil disinfectant has several advantages, among them, that it is non-toxic to dogs and only slightly toxic to cats. It has a pleasant odor, is inexpensive, is easily prepared and can be so nearly completely washed from the animal that it leaves only a slight pine oil odor, which is quite agreeable to many persons. Many people say they prefer it to the dog odor that their dogs have before being bathed. Pine oil disinfectant can be used effectively in a 1% to 2% solution on dogs without any ill effects. Two ounces of pine oil to one gallon of water makes a 1½% solution. Thoroughly wet the skin and hair of the dog, being sure to wet the entire skin, as the solution must cover the fleas in order to kill them. This solution can be left on the dog or washed off in one-half to one minute. This pine oil solution will kill all of the fleas and adult "crawling lice," *Trichodectes latus,* but will not kill the "sucking lice," *Linognathus setosus,* or immature lice or ticks. The kennels or sleeping quarters can be thoroughly washed and sprayed with a 5% solution of pine oil, which kills both the adult and immature stages of the fleas.

CATS being more sensitive to pine oil, it is necessary to use for them a weaker solution, slightly less than 1%, and to wash it off after one minute. Since cats are very sensitive to any odor, it is well to allow their sleeping quarters to air out after spraying with a 5% solution of pine oil, before placing them back. Some prefer to use kerosene for spraying, again airing out the kennels before returning the animals to them. Both the 5% pine oil and the kerosene are effective in killing the immature and adult stages of fleas, and the kerosene will kill most of the other parasites present if it comes in contact with them.

ROTENONE solutions probably have all the advantages of pine oil disinfectant, with the exception that rotenone is considerably more expensive to use. A satisfactory

1% rotenone solution can be purchased from several of the biological houses under their own trade names, such as rotocide, rotenone dip, and tickicide. Two ounces of a 1% rotenone solution in one gallon of water is effective for both fleas and ticks. The dog must be thoroughly soaked in the solution and it must be allowed to remain on the animal for a short time. For ticks it must be left on at least three hours in order to kill the large females. After this time the ticks are killed but not detached from the dog, and therefore must be removed mechanically. This 1½% solution also makes a satisfactory spray for the kennels or sleeping quarters. Some of these rotenone solutions have oil of sassafras in them, giving to the dog or kennels an odor which is not objectionable to most persons.

CREOLIN is occasionally employed, but because of its strong and unpleasant odor, it is rarely used on pet dogs, and because of its toxicity to cats should never be used on them except in very weak solutions which are immediately washed off. Creolin can be used on dogs kept out of doors or where the odor is not objectionable. A 1% solution is generally used and it must be thoroughly washed off or it will cause considerable irritation to the skin and especially to the scrotum.

Some practitioners use commercial ether to kill ticks and where the dogs are infested with both fleas and ticks the commercial ether will also kill the fleas. Commercial ether is more expensive than pine oil and has the advantage only of drying immediately and leaving the dog's coat dry. It is explosive. Care must be exercised in its use.

Calcium Metabolism

Additions of lactose and cod liver oil to the diet facilitate calcium resorption in the intestinal tract.[74] A hormone influencing calcium metabolism was extracted from the parathyroidea. Parathyroidectomy is known to lower the calcium level of the blood. The milk fever of cattle is thought to be a momentary disorder of the parathyroid function, preventing the regulation of calcium metabolism. The hormone from the parathyroidea is also capable of eliminating lead from the bone structures in cases of lead poisoning.

Vitamins and Nutrition

The five most important vitamins[77] are A, B (complex), C, D, E, of which A, D, and E are fat soluble; B and C water soluble. The vitamin A in cod liver oil possesses a strongly curative action upon local infections of the eye or skin, but not upon general infections. It does not possess bactericidal properties, but activates the regenerative faculties of the tissues. The feeds of domestic animals contain practically no vitamin D, but the animals are capable of producing it in the skin under the influence of sunlight, especially those animals in which skin is but slightly pigmented. Vitamin E is contained in the oil of cereal germs; lack of this vitamin in the ration causes abortion. Its subcutaneous application in cases of sterility of cattle resulted in pregnancies in 70% of the cases. Vitamin B is a complex consisting of five factors, B_1, B_2, B_3, B_4, B_5, but only the first two are of any consequence in animals. In man lack of vitamin B_1 causes beriberi, lack of vitamin B_2 causes pellagra. Vitamin C is the antiscorbutic vitamin. Most animals are able to produce it synthetically.

[74] Folling, A. Physiology of calcium metabolism (Trans. title). *Norsk. Vet. Tidskr.* 48:484-490.

[77] Chelle, P. L., 1937. The rôle of vitamins in the nutrition and therapy of domestic animals. (Trans. title). *Rév. Vét. et Jour. de Méd. Vét.* 88:425-446.

Intussusception in the Oviduct of a Hen

February 2, 1938, a white leghorn pullet was brought to the veterinary clinic of Kansas State College for post-mortem examination.

Externally the bird showed a distinct cyanosis of the comb and wattles. Examination disclosed a marked congestion of all the muscles. Several detached ova were found in the abdominal cavity; the oviduct was congested; and along its middle portion was a soft enlargement (see illustration between figs. 2 and 3) which fluctuated slightly. Upon incising it a blood clot was revealed.

A closer examination revealed that a true intussusception of the oviduct was present just anterior to this enlargement (see illustration, fig. 3. Figs. 2 and 4 represent the continuation of the oviduct, and fig. 1 designates the suspensory ligaments and attachments.)

This condition, a true intussusception, differs from the prolapse of the oviduct commonly seen. The differentiation is based on the fact that this is a true telescoping, as shown by the illustration, in which it is apparent that the condition is located a considerable distance from the cloaca. A prolapse is usually an excessive amount of the eversion of the oviduct which normally occurs at the time the egg is laid, and is commonly found in hens that have been pushed to a high production level.

So far as I am able to find there is no literature on this particular condition, and with this in mind the description was considered worthy of recording.

M. A. Schooley, K. S. C., '38.
Manhattan, Kans.

A Case of Imperforate Anus in a Pig

January 10, 1938, the writer was called in consultation by Dr. R. M. Dissinger of Moultrie, Georgia, to determine the cause of illness in a small herd of hogs at Norman Park, Georgia. On arrival at the farm it was found that the owner had separated three of the animals from the herd and had placed them in a small enclosure for examination; all three were showing symptoms of pneumonia. On examination one of the

The rectum and vagina slit open.

three pigs was found to have an imperforate anus, the feces being passed through the vulva. Since this pig showed the most severe symptoms of pneumonia, it was killed and the rectum, with its adnexa, was brought to the laboratory for further examination.

The photograph shown here was taken after the rectum and vulva were slit open. The arrows point to the rectal tissue and the vulva.

The owner stated the pigs were about six months old; the weight of the one with an imperforate anus was estimated at 90 pounds.

H. B. RAFFENSPERGER,
U. S. Bureau of Animal Industry.
Moultrie, Ga.

Butyl Chloride As an Anthelmintic For Strongylidae in Horses

Experimental testing of butyl chloride as an anthelmintic, under the direction of Dr. Benjamin Schwartz, Chief of the Zoölogical Division of the B. A. I., has shown great promise. The following description of its use in three recent cases furnishes evidence of its high efficiency.

A bay stallion 11 years old weighing 2000 pounds; a black mare nine years old weighing 1500 pounds; and a black mule about 20 years old weighing 1500 pounds, all belonging to the Department of Surgery and Medicine, Kansas State College, were found by means of microscopic examination to be infested with strongyles. The mule had the heaviest infestation of the three. December 22, 1937, both the mare and the mule were given 150cc of butyl chloride in 500cc of castor oil and 1500cc of mineral oil. Two days later 200cc of butyl chloride in two quarts of mineral oil were given to the bay stallion.

At 8 a. m. January 3, 1938, they were all given a lethal dose of chloral hydrate intravenously in preparation for use by the operative surgery class. On post-mortem examination of the stallion 11 hours later, no parasite of any kind was found. The intestinal tract of the mule was examined two hours later, but no parasite was found, although all over the mucosa of the caecum and the colon were milletseed-sized congested lesions surrounded by thickened, elevated zones showing where strongyles had been attached. Apparently they had been forced to dislodge themselves from the mucosa, and had been expelled with the feces.

The mare was autopsied the following noon. No parasite could be found. Fecal examination (centrifugal method) was made, but the result was negative.

WONG TIT, K. S. C., '38.
Manhattan, Kans.

Surgical Treatment of Chronic Laminitis

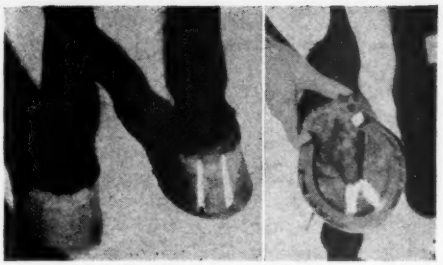
Veterinary literature tells us that laminitis, or founder, is nearly always localized in the front feet in horses, while cattle are usually affected in the hind feet only.

This disease may result from overeating, overwork on hard roads, drinking an excessive amount of water, riding on railway cars, or, in the case of the mare, it may follow foaling. The chronic type of laminitis may occur as such, or may be a sequel to the acute form.

Clinical symptoms consist of slight to extreme lameness in one or more feet, depending upon the area involved and the amount of inflammation set up. In the early stages there is an extreme engorgement of the smaller vessels of the foot, resulting in extensive inflammation and hyperemia of the tissues, followed by exudation and degeneration. As a result, the sensitive laminæ lose their intimate contact with the horny wall of the hoof; and in the anterior part of the hoof (where the condition is usually more severe) there may be a complete separation of these structures, owing to the traction of the flexor tendons of the leg leaving a space which fills with a gelatinous exudate.

The whole foot appears shrunken transversely, and elongated antero-posteriorly; this condition is caused by a breaking down of the wall, to be described later, and by an acceleration of horny growth produced by the stratum germinativum.

When the foot is on the ground the proximal half appears almost vertical, while the



distal half flattens out in an abnormally horizontal position; the hoof appears drawn in about half-way down the wall. This condition is brought about by the pull of the body weight on the remaining healthy lamina at the proximal extremity of the hoof. The distal extremity, no longer attached, spreads outward and forward.

Rings or rugæ appear in the hoof wall parallel with the coronet. These are thought to be due to irregularities in the nutrition of the growing wall.

"Going on its heels" is a common symptom of an animal affected with chronic laminitis. The anterior part of the hoof is so badly affected that it is the natural tendency of the animal to favor that part.

Dropped sole is a term often used to describe an abnormal convexity of the horny sole. An opposite condition may sometimes be found; the germinal layer completely ceases its production of horn, and when the sole wears thin, an exudation from the inner structures breaks through. Contamination soon results in the formation of abscesses.

Chronic laminitis does not readily yield to treatment. A surgical method of treatment was demonstrated at the A. V. M. A. convention in Chicago in 1933. It consists of grooving the walls and sole of the foot and applying a special shoe. This method was used with success on the following case.

An aged Shetland pony, gelding, was presented at the veterinary clinic of the Kansas State College on December 21, 1937. It was in excellent flesh, the only pathological symptom consisting of a pronounced lameness in the left front foot. The history revealed that the lameness had originated in May, 1937. There was also a history of intermittent overfeeding. Previous treatment had included soaking feet and the application of tincture of iodine to pustular areas that had appeared.

The foot was trimmed to its normal size as nearly as possible. Three cubic centimeters of a 2% solution of procaine was injected over each volar nerve.

Two parallel grooves one-quarter inch wide and deep enough to reach the sensitive laminæ were made in the wall at the toe. Each groove was three-quarters of an inch from the median line, and extended from just below the coronary band to the plantar surface, continuing on the sole and terminating at the point of the frog. The accompanying photographs show the position of the grooves and their approximate width.

A shoe with calkins three-quarters of an inch long was then fitted to the hoof; this served to reduce the strain on the flexor tendons.

The foot was bandaged in a pack saturated with a 1-1000 bichloride of mercury solution to prevent infection and to provide moisture to the hoof . This pack was changed every second day for approximately two weeks, until the raw surface had healed over.

Within two or three days following the operation it was noted that the horse walked with less lameness, and a gradual improvement was observed until the animal was released from the hospital on February 4, 1938—45 days after it was entered. Its gait was then normal.

H. D. Rodebaugh, K. S. C., '38.
Manhattan, Kans.

Prevention of Blackhead in Turkeys

In a previous article Enigk [70] proved that blackhead is caused by a fungus. Experimenting further with this disease, he found that a 1% lugol solution given as drinking water prevents blackhead infection. In turkeys already infected this treatment proved less efficient.

[70] Enigk, K. Treatment of blackhead (Trans. title). *Tierarztl Rundschau* 42:406-407.

The Digestion and Absorption of Raw Starch in Dogs*

By B. B. ROSEBOOM and J. W. PATTON,
East Lansing, Michigan

Several studies have been made concerning the digestion of raw starch. Langworthy and Deuel (1920) found the coefficient of digestibility in man to be nearly 100. More recently Roseboom and Patton (1928) found that dogs were able to digest raw cornstarch in large amounts. Their method, similar to that of Langworthy and Deuel, consisted in the chemical examination of feces from dogs which had been fed large amounts of this carbohydrate. The feces were subjected to the iodine test for starch and were found to be uniformly negative. The material was then hydrolyzed with dilute acid and tested for glucose. No glucose was found. They fed up to 75 grams raw cornstarch to dogs weighing about 15 kilograms, and concluded that dogs digested this quantity.

These authors also studied the amylolytic activity of extracts and secretions of dogs' salivary and pancreatic glands and believed that the pancreatic amylase was comparable in activity to that of omnivorous animals. Rosenthal (1929) fed raw starch to rabbits and other mammals and followed the curve of blood-sugar. He concluded that starch was digested and absorbed so slowly that the blood-sugar was not appreciably elevated. He fed important amounts of acid with the starch in order to delay its passage through the gut. More recently still Childrey, Alvarez and Mann (1930) have reported studies on digestion in dogs after colectomy. Their work suggested that there is little or no digestion of raw cornstarch in dogs and this interpretation has been made from their report. It is to be noted that these animals had a shortened digestive tube, that their findings were not based on chemical analyses, and that they were not definitely seeking for a proof of the digestibility of starch. They were searching for a "low residue" diet and were not chiefly interested in the chemical nature of the residue.

STARCH DIGESTION, DOG 1. FEMALE 15.5 KILOS

DAILY INJECTION OF 1.2 GRAMS PHLORIZIN IN OLIVE OIL

Date (1930)	FOOD	URINE						
		Amount in 24 hours cc	Nitrogen per cc grams	Nitrogen total grams	Glucose from protein grams	Glucose "Extra" grams	Glucose total grams	D/N ratio
April 16	240 grams lean meat							
April 17	240 grams lean meat	1,010	0.0134	13.53			78.70	5.81
April 18	240 grams lean meat	1,000	0.0155	15.50			65.00	4.19
April 19	240 grams lean meat	1,100	0.0144	15.84			58.60	3.7
April 20	240 grams lean meat plus 50 gm. raw starch	1,500	0.0094	14.10	51.47	38.53	90.00	6.38
April 21	240 grams lean meat	1,500	0.0087	13.05	47.63	7.12	54.75	4.19
April 22	240 grams lean meat	2,000	0.0081	16.20			59.00	3.64

*This article, published a number of years ago (March 1932) in *The American Journal of Physiology* (Vol. 100, No. 1), deals with fundamental matters in the nutrition of dogs. Because it is not readily available to the majority of veterinarians who do not have access to large scientific libraries, it is reprinted here by request, that it may be available to that large body of veterinary practitioners who are interested in canine nutrition.

Because of this apparent disagreement we are led to report this experiment in which phlorizinized dogs were the subjects. We chose the phlorizin method as one which should definitely establish the facts of digestion and absorption of starch. This method on dogs has given good results in the hands of numerous investigators: Lusk (1912), Csonka (1916), and Olmstead (1920).

Two female dogs weighing 15.5 and 17 kilograms respectively were given daily injections of phlorizin in oil, 1.2 grams. They were also given several daily hypodermic injections of 0.2cc 1 to 1000 adrenalin hydrochloride. The urine was collected in 24-hour periods. The dogs were fed 250 grams of raw, ground, lean beef daily. The total nitrogen was determined by the Kjeldahl-Gunning method and the glucose by the method of Hawkins and Van Slyke (1929). The D/N ratios were calculated daily. When the D/N ratio approached 3.65, after a few preliminary days, the raw cornstarch was added to the ration for one day and determinations continued until the D/N ratio again approached 3.65. The results are indicated in the table. The data on the other dog were closely similar. The glucose derived from protein is obtained by using the factor N X 3.65. The remainder of the glucose or "extra" glucose is derived from the starch. The result shows a nearly quantitative digestion of the raw starch. Commercial cornstarch contains about 9% of water.

Summary

By the use of the phlorizin method it appears that dogs digest large quantities of raw cornstarch.

BIBLIOGRAPHY

Childrey, J. H., W. C. Alvarez and F. C. Mann. 1930. *Arch. Int. Med.* lxvi, 361.

Csonka, F. A. 1916. *Journ. Biol. Chem.*, xxvi, 327.

Hawkins, J. A. and D. D. Van Slyke. 1929. *Journ. Biol. Chem.*, xxxi, 459.

Langworthy, C. F. and H. J. Deuel, Jr. 1920. *Journ. Biol. Chem.*, xi, 1.

Lusk, G. 1912. *Ergebn. d. Physiol.*, xii, 372.

Olmstead, W. H. 1920. *Journ. Biol. Chem.*, xli, 45.

Roseboom, B. B. and J. W. Patton. 1928. *Journ. Vet. Med. Assoc.*, lxxiv, 768.

Parasites in Some Wild Fur Bearers

This investigation was undertaken to discover the incidence of parasitism in our small, wild, fur-bearing animals. Laymen and many veterinarians seldom give thought to the fact that skunk, civet cat, oppossum, muskrat and other common fur bearers may be heavily parasitized, and possibly serve as vectors in infesting some of our domestic animals.

During the 1937 fur season the writer collected carcasses of skunk, civet cat, opossum, and muskrat trapped in the vicinity of Manhattan, Kansas; a post-mortem examination was performed upon each animal and the incidence of parasitism was as follows:

Animal	No. Examined	Parasitized	Not Parasitized
Muskrat	5	0	5
Skunk	11	8	3
Civet cat	10	6	4
Oppossum	7	7	0
Total	33	21	12

The parasites collected were identified to their generic classification. It was found that the oppossum harbored Physaloptera and Ascaris, while the skunk and civet were infested by Ascaris alone. The muskrats examined were not parasitized. Mönnig reports the occurrence of Ascaris in the skunk, but not in the civet cat. He makes no mention of either Physaloptera or Ascaris as infesting oppossum.

The majority of these animals were not heavily parasitized; three oppossums, however, were found to be harboring about 90 round worms each. The average number of parasites found was about 15 per animal.

Since the animals used were wild, and had not been in a state of captivity, these findings further disprove the popular belief that wild animals are seldom parasitized.

JOHN S. HALEY, K. S. C., '38.

Manhattan, Kans.

✓ ✓ ✓ ✓

In choke, after administering an antispasmodic, we always leave the owner some white liniment to rub on the throat. This takes his mind off his troubles, and does the patient no harm.—*E. T. B.*

Iodine Vapor Therapy*

By R. L. HIGH,
Philadelphia, Pa.

Most veterinarians have lamented the fact that they have but a few drugs at their command which give definite results when administered. Their list of drugs is quite large; but there are too few on which they can actually depend for specific action. In no field is this more true than in the field of antiseptics. Hardly a week goes by but a new antiseptic is presented for favor. From the Carrel-Dakin solution which, once on the crest of the wave of popularity, is now discarded, to the various dyes which are great today and cast aside tomorrow, their deficiencies are all too apparent.

Since 1819, when Coindet, Sr., first used iodine medicinally, until now, this valuable element has been combined in almost every known way in an effort to get maximum efficiency. However, when linked in most combinations it is not free to exert its antiseptic value. On the other hand, in ordinary tincture of iodine or in any water or hydro-alcoholic substitute in which hydriodic acid or the iodides are used for their solvent action, we have a product which, although strong enough to be antiseptic, is, because of its infiltration, equally destructive to tissues and to bacteria.

Crile asserts that iodine energizes metabolism and that normal health is not to be had without a sufficient amount of iodine, which is usually supplied in food and drink. One of the functions of the thyroid gland is to take up iodine and store it as an iodized albuminoid to be used as a hormone.

Sajous attributes to iodine the place of a physiological constituent of, and active factor in the systemic defense against infection by sensitizing pathogenic bacteria to phagocytosis.

Iodine raises the germicidal powers of phagocytes, hastens the elimination of the by-products of cellular catabolism, and displays a peculiar selectivity for specifically inflamed or infected tissues. It stimulates the glands of internal secretion, prevents the formation of necrotic tissue, and favors the absorption of inflammatory exudates. It dilates the blood vessels and increases the peripheral circulation, as well as the circulation of the coronary arteries which supply nourishment to the heart.

We chemists have worked with iodine in numberless phases of combinations over a period of 38 years, and we now feel that we can present to the medical and veterinary professions a unique preparation of iodine in which its many valuable properties can be utilized along lines heretofore unknown.

We have made novidol, a new iodine in oil. Its strength is 0.5%. It is perfectly stable to light, time, and precipitation, but not to air. It gradually loses some of its potency on exposure to air. In novidol we have the activity of iodine by contact and as a vapor, in a non-irritating form. If novidol be poured on unstarched cloth, in a few moments all color vanishes, the iodine having evaporated without attacking the fabric. In this characteristic novidol is wholly different from other iodine products.

A piece of wetted starched filter-paper or cloth held over an open bottle containing novidol will in a moment show the blue starch reaction. The vapor of iodine reacts without actual contact of the material and without application of heat. Thus we have in novidol a bland liquid giving off atomistic vapor of iodine which will cover any membrane in its presence with an infinitesimal film of iodine capable of exerting the powerful antiseptic action to be expected from pure sublimed iodine.

We foresee a wide field of usefulness for this product in veterinary practice. When used externally as an antiseptic, one must remember that the product owes its activity to free vapor of iodine and that it should, therefore, be suitably covered with cello-

*Presented at a meeting of the New York County Veterinary Association, October 3, 1937.

phane, oiled silk, or bandage. If bandage is used, novidol can be poured on without re-bandaging. Its value in wounds is apparent the first time it is used, as its mineral oil base is non-absorbable in the tissues. There are no sandy granulated serum particles to irritate; the wound is bathed with a pure, non-irritating form of iodine. Novidol will not infiltrate.

There are many internal conditions where this activity due to vaporizing is important. We cite an example:

Case 1.—A Chesapeake Bay retriever, female, age three years, with a fistulous tract in the temporal bone was hospitalized October 25, 1936. This dog had previously had a chronic auricular catarrh, which had presumably healed. A swelling appeared over the temporal arch, and the discharge from the ear reappeared. Examination revealed a fistula in the external ear, on the medial side above the opening into the middle ear, from which a thin purulent discharge escaped.

Owing to the low position of the opening, it was impossible to drain thoroughly. An opening was therefore made above the temporal bone, and the fistulous tract was drained and washed thoroughly. Novidol was injected freely, and a tampon saturated with novidol was inserted. This procedure was followed daily. The dog was discharged fully recovered November 12, 1936.

The value of this free vapor of iodine is equally applicable in any canal difficult to treat, as well as in vaginal, intra-uterine, aural and rectal infections.

Iodine is probably even more potent as a fungicide than as an antiseptic. We see its action quite plainly in treating all forms of tinea. The treatment consists of placing cotton wetted with novidol over a ringworm area and bandaging with glazed paper, cellophane or other covering to keep the vapor of iodine from escaping. The next day the visible tinea is stained a brownish color, and there is, in addition, an areola stained a lighter brown representing the subcutaneous tinea. Both are killed after three to six daily applications.

The fungicidal properties of novidol should help the veterinarian in many so-called skin diseases of fungous origin. There is an infection in lethargic dogs, such as scotties, daschunds, and pomeranians, which may be likened to athlete's foot in the human. When the bulbous eruptions are opened and novidol or vapodine (1% iodine) is applied on cotton or on the foot direct and bandaged with wax paper, cellophane or oiled silk to keep the iodine fumes in contact, recovery is prompt. It is well to appreciate, in this and many other conditions of infected hairy surfaces, that an antiseptic with an oil base makes an immediate contact with oily hair.

Bassler writes that "the intestinal canal is the greatest source of focal infection in the body" and that "intestinal toxemia is the commonest disorder of human beings." Many of the diseases of smaller animals also can be traced to stomachic and intestinal infections. When novidol is given orally, the body heat causes the vapor of iodine to be given off gradually as the product descends the intestinal tract; we are literally able to paint atomistic iodine over the whole gut. Let us cite a case to show its therapy when taken orally:

Case 2.—A German shepherd male, age nine years, suffering from canine typhus or Stuttgart disease was hospitalized October 27, 1936. For a week he had vomited water, the excreta were putrid and diarrheal and he was becoming emaciated. The temperature was 104.2 F, the pulse weak, with characteristic buccal ulcers and fetid breath.

Treatment: milk of magnesia cleansing the first day; second day two drams novidol orally every three hours, and novidol was applied to the ulcers every three hours. This treatment was continued for one week. One ampule sol-liver was given daily.

Food: barley water via the stomach tube daily for two days, followed by buttermilk, sour milk, raw liver, then well cooked lamb.

The dog was discharged fully recovered November 9, 1936; the total treatment having required 13 days.

The foregoing case established a definite dosage of two teaspoonfuls every three hours continuously for 13 days, without the slightest sign of irritation or toxemia in any phase.

Novidol when mixed with an equal amount of mineral oil has been given in sufficient quantity that the oil came from the anus a definite purple color. So long as the oil is colored purple, iodine is present; in other words, the antiseptic action of atomistic iodine, resublimed, can be had from mouth to anus.

A veterinarian reports an interesting example of distemper prophylaxis in a breeding kennel. A kennel of 30 dogs had been

moved into new quarters, the owner not knowing that the place had previously been contaminated by animals with distemper. All the dogs became sick in varying degrees of sniffly nose, fever, running eyes, etc.; four were in bad shape. All received novidol intranasally four times a day. Four died and the others recovered. It should be noted that when novidol is applied intranasally, the germ-laden area with its inflammatory exudate is soon completely covered and caking of the nasal secretions occurs, so that much care should be exercised before the dog is left for the night to see that the nasal tract is adequately washed with a saline solution to insure free breathing. This contingency should not eliminate the treatment with novidol, for there can be no logic in compelling the dog to breath air coursing over a heavily germ-laden area when the saline will overcome the encrusted secretion.

* * * *

Helminthiasis and Eczema in Dogs

Eczema is one of the skin disorders which frequently and obstinately defy treatment, and has been put into the class of diseases which depend upon individual susceptibility to certain factors.

One of the most frequent causes of eczema in dogs is undernourishment, and therefore the condition often quickly yields to abundant feeding of a properly selected diet. However, there are cases which become worse no matter what ointments are applied, or dietary changes introduced.

The case here described may be of interest to the profession, because it adds to the list of causative factors in eczema one not infrequently overlooked in the diagnosis.

A male dog of the smooth collie type became afflicted with a mild case of eczema when about one year old. The trouble increased during the hottest part of the summer, and improved somewhat during the cold weather. However, the condition became worse with each successive year, so that after three years the animal was suffering winter and summer alike, and was pronounced incurable. There was loss of hair, listnessness, thirst, great nervousness and changed disposition. During that period the dog was treated externally with practically every skin prescription ever made, and the diet was changed several times, hoping to detect the food or foods which disagreed with him.

The animal appeared extremely run down, and finally reacted so unfavorably to certain skin dressings, that symptoms of poisoning were apparent (polydipsia, cyanosis).

Despite the opinion of others to the contrary I suspected the presence of intestinal parasites, and had a laboratory examination of the feces made which left no doubt that tape worm infestation was serious.

Two weeks after administration of the proper anthelmintic, the skin began to show signs of clearing up, and hair appeared on the bare patches.

Past experiences have demonstrated that intestinal parasites are more frequently responsible for serious ailments in animals than is suspected. It would appear advisable to make a laboratory examination for such parasites before any kind of treatment for the supposed ailment is undertaken. This would save time, and in many cases also the life of a valuable animal. It is obvious that, as in the case reported, no external treatment of any kind can be of the slightest use, where the constant irritation of the intestinal canal, and the autointoxication produced by the parasites are the root of the dermatosis.

The importance of fecal examinations for parasites was supported in a similar case, where hookworm was the causative factor. Dogs have been treated for distemper and pneumonia, when hookworms during the intermediary stage of their cycle in the lung actually caused the symptoms, as was subsequently discovered.

The multiplicity of the disorders produced by helminthiasis, often far removed from the seat of invasion, suggests that examination for parasites should be the first step toward a successful diagnosis of the underlying disorder, whether dermatoses or other dysfunctions be the symptoms.

HILDA VON HELLMER-WULLEN.
Huntington, L. I., N. Y.

Canine Pediatrics

I. Canine Pediatrics in Veterinary Practice

By D. M. CAMPBELL, Chicago, Illinois

Pediatrics is a new word in veterinary medicine. It is not as appropriate as the writer could wish. Stedman defines pediatrics as "The branch of medical science which treats of children in their hygienic, physiological and pathological relations." Applied to dogs from conception to weaning, this defines the scope of this discussion. It does no greater violence to etymology to speak of canine children than of animal population and that occurs in staid reports of the Bureau of Animal Industry. Such expressions as "baby chick diseases" and "vaccination of baby pigs" have been admitted to the society of good words. Why not canine pediatrics, notwithstanding the first syllable of the word means child? Cyniatrics is too inclusive for our purpose; and puppy is derived from a word meaning girl, which brings us back to the starting point.

BEING a baby, either human or animal, is a hazardous occupation, more hazardous than being a soldier in time of war, or a stone cutter or a radiologist or even a pedestrian on an automobile highway.

Fortunately, a good deal can be done about it—more than can be done about most of the other hazards to life and limb and health. In the case of the human baby, very much has already been done about it. Taking the turn of the century as about the time when the family doctor definitely replaced the midwife at the accoucheur's task and when the physician's advice instead of that of the neighborhood granny began to be sought about feeding the baby and the young child, let us examine mortality tables for the last four decades:

Deaths of Infants Under One Year of Age (Exclusive of Still Births) per 1,000 Live Births

1900	157	1930	64
1910	133	1936	57*
1920	85		

* Latest official statistics available.

No comparable showing in the saving of lives can be made for animal babies. There are two reasons for this: (1) proportionate funds for research have not been available and (2) such research as has been accomplished has availed proportionately less for lack of a skilled personnel to put the newly-discovered facts to a productive use; the economics of the situation being such that it was deemed necessary for the live stock owner to carry out scientific programs without technical supervision such as the caretaker of the human baby largely relies upon.

RANSOM and Raffensperger have pointed the way to reduce the losses in baby pigs; yet we pasture, house, feed and care for 12 million brood sows to farrow 60 million pigs to market 40 million hogs—12 million sows doing a job for which five million are adequate. Williams and Udall have told us how to rear healthy dairy calves, yet a high percentage die and most of the remainder are more or less hopelessly stunted. Army veterinarians and Dimock have given us the same information for foals, and yet horse raising is one of the major hazards of the live stock industry. In matters of infant mortality the sheep industry and the poultry industry fare scarcely better. This picture questions the soundness of the premise that the live stock raiser cannot afford the guidance of the veterinarian in rearing young animals even as the human mother is coached by the pediatrist. It may well be he cannot afford to operate without such guidance.

But for stark tragedy among the young of domestic animals the fate of the newborn puppy stands out. Excluded from public appropriations, prince or pauper, the dog is, officially, a pariah. Neglected by private philanthropy and discriminated against by anti-vivisectionists, the dog has been denied all benefit from modern research except

that carried out quite recently by commercial interests, and that incidental to studies in human physiology, pharmacology, surgery, pathology and nutrition. Of the meager information (pertaining to the dog) evolved by the latter, veterinarians have avidly availed themselves. At the time Goldberger was conducting his now famous investigation into the causes and prevention of pellagra, this magazine published every part of his report that had a bearing on nutritional deficiency in the dog and a wide interest was instantly manifested in the subject among veterinarians, as the veterinary literature of the period and since amply testifies.

IN the present series of articles, which may require approximately a year to complete, VETERINARY MEDICINE will again bring its readers the information developed in an extensive research into the nutrition of the dog—this time of the baby dog. A striking, although fully expected demonstration of this research is that in the infant dog, as in the human infant, most of the ailments are referable to errors in nutrition. Of course, this statement will surprise no veterinarian, so far as it applies to artificially fed puppies. It may surprise some, however, to learn that at times the dam's milk is not an ideal food for the puppy. The highly artificial existence imposed upon most cared-for city dogs, the manifold deficiencies in feeding and in-and-in breeding, lack of exercise, disease, parasitisms, etc., that have so markedly affected the reproductive functions, have, perhaps to a degree not yet appreciated, affected the adequacy or suitability of the mother's milk for her offspring; for lactation is as truly a reproductive function as is ovulation. The various factors that have brought about the necessity for thousands of cesarean sections annually and made common among bitches, irregular estrum, "shy" breeders and sterility, could scarcely be expected to leave lactation unaltered. The breeder has long recognized this, but in the absence of exact knowledge, he could think only of "acid milk" as responsible for his disasters.

Fortunately, investment in dogs and the sentiment with which they are regarded is sufficient to induce their owner to seek veterinary advice to lessen the loss of young puppies when they are convinced it will be effective.

Precise figures on the extent of the dog breeding industry are wanting. Capt. Will Judy, editor of *Dog World*, places the number of commercial breeders of purebred dogs at 40,000; the number of purebred bitches regularly bred to produce pup-

BOTTLE FED PUPPIES

These well-developed Beagle pups were taken from their mother five days after birth. Thereafter, they were raised entirely on simulated bitch's milk, developed at the Borden Biological Research Laboratories at Bainbridge, New York.

pies for sale at 120,000; the number of litters (one and one-half per bitch) at 180,000 per year, and the number of pedigreed puppies whelped alive at 900,000; of which he estimates 15%, or 135,000, die during the first two weeks of life.

WHEN VETERINARY MEDICINE learned of a sound research project carried out over a period of 14 months at the excellently staffed and equipped Borden Laboratories at Bainbridge, N. Y., that had for its object throwing light on the nutritional requirements of puppies, investigation seemed in order immediately. It revealed findings of great and far-reaching importance in a field hitherto untouched by scientific investigation. In the true spirit of scientific men, Dr. G. C. Supplee, Director of the Borden Research Laboratories, and his associates freely offered to supply complete records of their research for the purpose of making the important information they had developed available to veterinarians.

These articles are prepared in collaboration with Dr. G. C. Supplee and J. H. Le Ware who sponsored and conducted the original experimental and clinical work at the Bainbridge laboratories. The articles will present case histories of clinical feeding tests, specific directions for preparation of artificial feeding formulas, directions as to frequency and amount of feedings, hygienic care of very young puppies from time of birth, control of digestive disturbances during critical age, technique of bottle feeding, weaning, consideration of the use of solid foods.

That the correct interpretation of these scientific records may be placed beyond question by anyone, the services of Doctor Patton have been requisitioned in the capacity of adviser and critic. Doctor Patton needs no introduction to readers of VETERINARY MEDICINE. His place in the top flight of authorities on the nutrition of the dog has been secure since his publication in 1928 of "Starch Digestion in the Dog." In the ensuing years his interest in this subject has been continuous and his research extensive. His wide experience will assure readers' confidence in the accuracy of the interpretation of the scientific record upon which this discussion is based.

RESEARCH and clinical work in the well-established field of nutritional science now makes available to the veterinary profession a milk formula simulating the nutritional characteristics of bitch's milk.

This phenomenal development is signifivant in the growth and evolution of veterinary science. It suggests a new concept—the veterinarian as a pediatrician—and it opens the doors to a new, specialized phase of veterinary practice—canine pediatrics.

Puppies taken from their mothers immediately after birth, and orphaned puppies, have been raised successfully, in clinical tests, with the new simulated bitch's milk. The potentialities thus afforded will readily present themselves to the veterinarian.

The veterinarian as a canine pediatrician, then, is concerned with nutritional practices which will promote the growth and health of puppies. Since growth, development, health, and the prevention of many diseases are based on sound nutrition, it follows, therefore, that the veterinarian as a pediatrician is concerned primarily with puppy feeding.

It is a well-known axiom that the ideal food for the young of any species is the milk of the same species, and that science has had difficulty in duplicating in their entirety all of the beneficial attributes and delicate balances of the components of natural milk. Nevertheless, we have only to witness the remarkable accomplishments in adapting milk other than human milk for the rearing of infants. The formulation and production of successful milks for the artificial feeding of infants has been the result of many years of detailed study concerning the chemical composition, physical relationships and specialized properties of the many milk constituents.

Such research correlated and amplified with direct clinical observation pertaining to the nutrition of the human infant over a period of decades has yielded information and disclosed basic principles whereby similar achievements have been made possible in the compounding of a milk product for

the artificial feeding and rearing of very young pups.

THE development of a scientifically conceived product possessing the equivalent nutritive merits of bitch's milk represents progress of a significant character resulting from the accumulated knowledge of biochemistry and draws upon the vast existing body of exact data pertaining to the rôle of milk in nutrition. It is based upon a careful study and consideration of such vital factors as:

1. Fats of various origins.
2. Application of knowledge relating to physical and chemical properties of proteins.
3. Consideration and analysis of characteristics of albumins.
4. Mineral balances.
5. Vitamin intake and balance.
6. Fluid and caloric intake as correlated with growth requirements and tissue hydration.
7. Fundamental concepts, theories, and observations regarding the general subject of allergy.
8. Specificity and merits of components of bitch's milk, colostrum and characteristic milk proteins.
9. General knowledge and specific observations regarding the mechanics of digestion and peristaltic action in the intestinal tract.
10. Physiological effect of lactose and other carbohydrates with reference to rate of absorption.
11. Liquid and solid food intake as correlated with age of pups with reference to proper development of musculature of alimentary tract.
12. Stimulation of bile secretion by the gall bladder, as affected by the character of the diet and feeding regimen.
13. Character and frequency of stools as an objective criterion for judging the compatability of foods.

THE practitioner, whether of human or animal medicine, always has had to depend largely upon research and the clinics for the development of new frontiers in medicine and nutrition. The full significance of the dietary, even in human health, is just beginning to be widely appreciated. A quarter of a century ago pediatrics occupied a relatively minor position in the field of human medicine compared with its extensive practice and acknowledged importance today.

The entire field of biochemistry has progressed from the development of new principles which have been applied rapidly to humans, but which are equally applicable to dogs and puppies.

The progress made during the last three generations in the field of infant and maternal nutrition has been largely the result of applying the facts and knowledge accumulated and disclosed in laboratory and clinic by the biologic investigator.

Heretofore, corresponding advances in the nutrition of puppies and bitches have been lacking. If the veterinarian in the past has had little to offer the dog breeder in the way of scientific pediatrics, it is because the application of new findings and principles disclosed by physiological research has demanded that human requirements be given first attention.

THOUSANDS of laboratory experiments have been conducted *on dogs* in the past, but only very recently has research been directed to systematic, experimental and clinical work for the benefit of the dog itself.

The increasing popularity of dogs, the enlarging ranks of dog owners, and a wider popular understanding of the rôle of nutrition, have combined in very recent years, however, to establish the need for a new specialized research objective with the primary purpose of a thorough understanding of the particular requirements for a balanced, optimum nutrition for dogs of all ages, especially for very young pups.

It is this new, specialized research and clinical work that is creating, for the veterinarian, the rôle of pediatrician, and that now equips him with a successful feeding technique for puppies. This new feeding procedure largely overcomes past unsatisfactory results in artificial feeding of very young pups. It assures optimum nutrition

and has the advantages of simplicity, stability of ingredients and economy of use.

AS HAS already been stated, the work will be reported in detail in a series of articles in VETERINARY MEDICINE, of which this is the first. It presents the results of an extensive body of data concerning the nutritional requirements of puppies. As a result of these studies, involving thousands of feeding tests on hundreds of dogs with scores of formulæ, the foundation has been established for a clinically proved science of dog pediatrics.

The purpose of this first article is introductory. The author wishes to emphasize the following general points, which will be developed in the succeeding articles:

1. A satisfactory simulated bitch's milk has been developed which is suitable for the artificial feeding of very young puppies.

2. Development of simulated bitch's milk was made possible only through application of the accumulated biochemical knowledge which has brought human infant feeding to its present high degree of efficiency.

3. Many previous concepts of puppy feeding must be abandoned or revised.

4. Clinical tests of the new feeding formula and technique for puppies definitely establish their soundness.

5. The development of simulated bitch's milk is the foundation for a new specialized science of dog pediatrics.

EDITOR'S NOTE: The second installment of this series on canine pediatrics will appear next month.

Torsion of the Large Colon

February 5th I was called to care for a seven-year-old gelding, weighing about 1700 pounds and in good trim.

The owner stated he let the horses out to exercise in the forenoon and about 11 o'clock noticed them playing together. The gelding took a roll, got up, ran through the deep snow for about 20 rods, and came back with his nose along in the snow. He put them in the barn, offered both a quart of oats, which the gelding refused.

At about 3 p. m., the gelding appeared uneasy, and at 9 p. m. was in great distress. The owner called me; by the time I arrived the horse had become violent. I gave one ounce chloral hydrate compound, continuing with this until up to midnight I had given four doses, but with no relief. I then turned to my hypodermic, with the same results.

At 4 a. m. on the 6th, the animal seemed quiet, and I made a more thorough examination. The general appearance foreshadowed death. Pulse 46, temperature 100.1°F., respiration shallow and fast, mucous membrane normal, peristalsis absent, tympanitic sounds. Rectal examination was shallow; I could insert my hand only a short distance. The examination revealed a heavy cord-like tissue on an angle from left to right at the point of the cecum in the pelvic cavity. I felt I was dealing with a torsion and informed the owner of my finding and that death was the only probable outcome. The animal was resting well in a standing position, so I went home to get some rest, returning about 10 a. m., when I found conditions about the same. I gave an intrajugular injection of one ounce sodium citrate and one ounce sodium chloride dissolved in 250cc of water, repeating this treatment at 7 p. m., with stimulants by mouth. Enemas caused great pain for about an hour.

This treatment was continued until February 12th, when the animal died and a postmortem examination revealed torsion of the diaphragmatic flexure of the large double colon. It was a half torsion. There were about eight quarts of solids in the bowels, with great quantities of water. The animal drank five to seven pails of water a day. After each treatment it passed small quantities of colored water, until the last few days, when there was no action. About 12 ounces of sodium citrate and sodium chloride were given; on post-mortem examination no bad effects showed from the continuous use of these drugs.

This horse ate nothing during the period of illness. On autopsy there was very little congestion, except in the lungs, and the liver was icteric.

J. H. WILSON.

Ewen, Mich.

Abstracts

Brucellosis of Swine

In regard to the relations between *Br. suis* and *Br. abortus*, the author [59] observed the great difference in the affinities of these organisms. The bovine organism produces abortion in pregnant heifers but not generally in sows. Of nine experimentally infected heifers and eight experimentally infected sows, all of the heifers and but one sow aborted from the bovine virus. The porcine virus seems to be specific for swine. The two organisms are easily differentiated by microscopic examination of bouillon cultures, which also show pronounced macroscopic differences. While the bovine cultures spread evenly over the visual field, the porcine clump together. The author noted that the cultural behavior of the organism of Malta fever (*Br. melitensis*) was intermediate between the bovine and porcine strains. As American workers have shown, the porcine strains are more pathogenic for guinea pigs than the bovine.

Contrary to the American observations, the *Br. suis* found in Denmark has but slight pathogenesis for man. During the period 1924-1932, 237 infected swine herds were examined and while two persons on these farms were attacked with undulant fever, the presence of bovine contagious abortion on both farms leads the author to conclude that these two cases were of bovine origin.

As compared with bovine brucellosis, the zones affected with porcine disease are limited in Denmark and therefore more extensive research and observations would have to be made to determine the degree of transmissibility of porcine brucellosis to the human subject, which in the United States is said to be higher than that of the bovine infection.

Agglutination, complement fixation and intradermal tests were employed. The latter is a useful diagnostic adjuvant. Abortin, intracutaneously injected produces pronounced local engorgement in 24 to 48 hours in affected swine but no reaction in non-infected animals.

In general, the lesions of porcine brucellosis are more distinct and more grave than those of other species. *Br. suis* paves the way for pyogenic organisms and attacks the genitals gravely, notably the uterus, ovaries, testicles, epididymus, seminal vesicles, Cowper's gland, and the prostate, which are seized with necrotic inflammations, cold abscesses, calcifications and cysts, all of which are more conspicuous than the organic lesions of other brucelloses. The boar is a spreader of the contagion. Miliary brucellosis of the uterus, found in 47% of the sows examined post mortem, was evidently the primary infection. The urine is highly infective and the conjunctiva is a portal of entrance when urine comes in contact with sound eyes. Boars are also readily infected by contaminated feed. Sow's milk was not incriminated as a source of infection for sucklings.

[59] Thomsen, Axel, 1937. La Brucelose de Porc (Brucellosis of Swine). Abs. *Revue de Médecine Vétérinaire*, 89:534-537.

* * * *

Castration of Lambs

Lambs aged one to three weeks should be castrated with a small emasculator, such as is used for castrating pigs.[67]. The best method of performing castration is by the covered method, leaving the tunica vaginalis intact. The method of enucleating the testicle together with the scrotum is considered dangerous on account of the possibility of afterbleeding. The use of the ligature, often employed by laymen, is condemned. The author obtained great success from the use of SandS tongs. Lately, the Burdizzo forceps were introduced into Norway. The author considers it a good instrument but criticises the high price and the fact that the animal castrated with this instrument appears like an uncastrated animal on superficial observation. According to the law for the prevention of cruelty, sexually mature animals have to be anesthetized during castration. Local anesthesia is accomplished with 5 to 10cc of a 2% solution of novocain; anesthesia takes place in ten minutes.

[67] Lund-Larson, H. Castration of lambs (Trans. title). *Norsk. Vet. Tidskr.* 48(3):108-111.

Do Dogs Dream?

Dreams depend upon a combination of observations.[72]. Whether the dog possesses an individual capacity for observation can not be affirmed with certainty. The feats of memory executed by certain dogs are often cited in proof of this capacity, but they are explained sufficiently by the association of visual impressions and memorized body movements. The movements of the body and the barking sounds of sleeping dogs cannot be interpreted as proof that the dog possesses a dream life. Investigations concerning the occurrence of sleep and dream resulted in the knowledge that movements and spoken sound during sleep are not occasioned by dreams, because during sleep the connection between the centers of sensitiveness and the cerebral cortex is interrupted. The assertion that the dog is able to dream is merely an assumption which cannot be proved.

Source and Functions of Vitamin A

Contrary to former opinions,[73] the chlorophyl-containing and yellow-pigmented plant parts do not contain vitamin A, but carotene, a provitamin. The vitamin A is formed in the animal body out of the carotene. It is not definitely established yet in which organ the formation of vitamin A takes place; possibly in the liver. At any rate, the formation proceeds very slowly, probably under the influence of the thyroid glands.

Carotenes are not uniform in nature; moreover, there occur other coloring matters in plant and animal products which cannot be converted into vitamin A. During the time of flowering the carotene content of plants is at its maximum.

Vitamin A is essential for the wellbeing of newly-born animals, although their store of vitamins is very low at birth. Evidently, vitamin A, as well as carotene, passes through the placenta only with difficulty. Lack of vitamin A lowers fertility. Horses fed vitamin deficient dry fodder for some length of time develop a hyperkeratosis. Periodic ophthalmia is possibly connected with vitamin A deficiency. Lack of vitamin A predisposes also to infection. During an existing infection the vitamin A store of the organism is depleted quickly. Vitamin A plays a rôle in mineral metabolism. Nervous disorders, too, are ascribed to lack of vitamin A. Light cases of vitamin A deficiency are apt to give rise to confusion with vitamin D deficiency.

[72] **Baege, 1937.** Do dogs have dreams? (Transl. title). *Ztg. d. Facsch. f. deutsche Schäferhunde.* 35:305-307.

[73] **Sjollema, B.** Vitamin-A deficiency in its relation to disease (Trans. title). *Tijdschr. v. Diergenecsk* 63:1141-1153; 1226-1240.

Diagnosis of Hog Cholera

For the diagnosis of hog cholera, Donatien and Lestoguard[68] recommend the injection of an emulsion of equal parts castor oil and defibrinated blood from a suspected hog into the skin of another hog which had been immunized 24 hours previously. The reading is carried out 24 hours after the injection.

Control of Hog Cholera

After the death of a pig the lice do not leave the skin immediately, but climb to the tips of the hairs where they lie in wait for contact with another pig.[69] Since lice are known to be carriers of hog cholera virus, the destruction of lice is a necessary step in the prophylactic measures against hog cholera.

Pyometra in a Cow

During a routine examination for pregnancy[62] in a herd of cattle a cow was observed to be in a seemingly advanced state of pregnancy. Examination per rectum revealed that the cow was not pregnant, but that probably a purulent metritis existed. When the cow was slaughtered, the womb was found to be degenerated, forming a large, smooth, yellowish-grey mass. The outlines of the horns could not be recognized. The os uteri was closed firmly. At its largest circumference the formation measured three meters; the weight was

[68] Donatien, A., and F. Lestoguard. The intradermo reaction in the diagnosis of hog cholera. (Trans. title). *Rév. Vét. et Jour. de Méd. Vét.* 88:657-668.

[69] Todoroff, A. Lice as carriers of hog cholera (Trans. title). *Rév. Gén. de Méd. Vét.* 45:581-586.

[62] Gerth. Pyometra in a cow (Trans. title). *Deutsche Tierarztl Wohnschr.* 44(27):469.

177kgm, about 1/3 of the total weight of the cow. On incision a creamy, yellowish pus ran out in large amounts. The wall measured three millimeters; the inner side was smooth-walled. Cotyledons could not be recognized. The other organs appeared normal. The meat was fit for consumption.

Brown Thymol Test and Physical Changes in Milk

Weekly quarter samples of fore-milk [60] secured from 35 cows over a period of four years were examined for the presence of mastitis streptococci, number of leucocytes per cc, reaction to brom thymol blue, and macroscopic appearance of the milk, while daily total milk and milk fat production records were also noted for each cow. It was concluded from these studies that streptococcic infections of the udder must be sufficiently advanced to make the milk alkaline to brom thymol blue or to show evidence of infection by changes in the physical appearance of the milk before any material effect upon production of milk or milk fat can be noted.

Bacteria Counts of Ice Cream

Total and coliform counts were determined for 77 process samples from seven local ice cream plants, 137 ice cream samples from 12 retail stores, and 36 dipper water samples from 18 places.[61] The results are applicable to the situation in many other municipalities where no previous bacteriological control has been exercised. Coliform counts were more sensitive than total counts for determination of the sanitary condition of ice cream dippers and dipper waters. Three of 12 manufacturers had all standard agar plate counts of store samples of vanilla ice cream under 100,000 per gram, commonly accepted as a standard, while eight had an average count under this figure. The average count of 112 store samples was 59,800 per gram.

[60] Hucker, G. J., 1937. The Relation of Bovine Mastitis to Milk Production; N. Y. State Agric. Exp. Sta. (Geneva, N. Y.) Tech. Bul. 244.

[61] Yale, M. W., and R. C. Hickey, 1938. The Bacteriological Quality of the Ice Cream Supply for a Small City; N. Y. State Agric. Exp. Sta. (Geneva, N. Y.), Tech. Bul. 248.

Vitamin B Deficiency in Sheep

Pallaske describes a vitamin-B deficiency in sheep, the lighter cases of which were amenable to treatment with yeast.[75] In this disease the animals fall ill suddenly and die under convulsions. Opisthotonos is the most characteristic symptom. Autopsy discloses few changes. On histological examination lesions indicative of an encephalomalacia are observed.

Resistance of Trichomonads

The trichomonads [63] of the bovine uterus are capable of withstanding freezing temperatures as low as 6.8° F., but are killed at temperatures of 120.2° F. They are fairly resistant to changes in osmotic pressure and to changes in acidity. Silver nitrate, chinosol, soda, sodium perborate, and chloramine possess a lethal action upon the trichomonads. Mucus and pus will prevent the disinfectants from reaching the protozoa. Solutions of chloramine 0.5%, soda 1%, and sodium perborate 2% are capable of dissolving mucus and pus, and at the same time kill the trichomonads without injuring the mucosa.

Diet and Fertility

The fertility of male and female animals depends a great deal upon the diet.[76] During the breeding season soy beans, millet, and barley may be substituted for oats to advantage. Grains supplemented with bran and oil cakes give better results than when fed alone. Millet possesses the most aphrodisiac action. Barley gives very good results when it is supplemented by additional protein foods. Rambouillet rams weighing 70kg needed 120 to 135gm protein per day when used for two services; when they were used for three services daily their protein needs rose to 145-160gm per day.

[75] Pallaske, G. Spontaneous avitaminosis in sheep. (Trans. title). *Arch. Tierheilk* 70.279-291.

[63] Mussill, J., 1937. Resistance of bovine trichomonads against physical and chemical reagents (Trans. title). *Wiener Tierarztl. Mtschr.* 24:104-109.

[76] Popoff, J. S. and G. Q. Okulitsches. Relationship between diet and sexual function (Trans. title). *Zeitschr. f. Zuchtung* Ser. B. 34.221-239.